

# **TOWARDS A EUROPEAN SOFTWARE STRATEGY**

**WORKING GROUP 6  
“SKILLS AND LIFELONG LEARNING”**

**Issue Paper: RECOGNIZING VALUE CREDENTIALS**

**Brussels, 27 February 2009**

## **Introduction**

### **High-tech Education and ICT Skills Capacity Building**

- Challenge 1** Promoting general e-skills and lifelong ICT learning among the labour force
- Challenge 2** Enhancing innovative talent capable of managing and expanding Europe's existing software capacity
- Challenge 3** Fostering innovative solutions and capacity building through multi-stakeholder partnerships and enhanced business-university cooperation

## **Conclusions**

## **Recommendations**

## **List of Group Members**

**Disclaimer:** The views expressed herewith are purely those of the Working Group and may not be regarded as stating an official position of the European Commission.

*“The financial crisis represents both a challenge and an opportunity for Europe. On one hand over 40 percent of Europeans have no basic ICT skills. In view of the pervasiveness of ICT this shortcoming is accelerating the social divide. On the other hand companies both on the information technology supply and user side have an increasing need for ICT skilled professionals. Figures from 2008 indicated the demand to reach 250,000 by 2010. Only 180,000 are likely to be available. The economic downturn will probably release the situation. However, the long-term trend of a shortfall poses a threat to job opportunities and Europe’s competitiveness in the globalised world. Therefore, it is critical for the success of European industries to re-skill Europe’s workforce for the needs of the knowledge-based economy. Industry-based qualifications and certifications are key factors in keeping European industries competitive. This fact needs to be recognized.”*

Michael Gorriz, euroCIO President, Brussels, 29 January 2009

## **Introduction**

In this global economic downturn, information communications and technology (ICT) industries continue to contribute to European employment, provide critical tools for European productivity, expand economic contributions, provide consumers an array of new benefits, and develop some of the most innovative technology in the world, including 'Green ICT' applications through 'smart infrastructures', and new, so-called 'cloud computing' platforms.<sup>1</sup>

The Working Group believes the ICT-embedded economy is built on the innovative capacity and creativity of its individuals. Europe already has the talent to compete and lead globally. Without the incentive to develop intellectual talent and human capacity, the industry falters. It is here that the European Commission and EU Member State governments need to focus their energy.

In considering how to best foster the European software industries, the Working Group encourages the Commission to continue its work to support the ICT skills capacity of Europe's talent. *E-Skills and human capacity building* must remain a critical cross-sectoral focus point in all areas of policy initiatives started by the various Directorates Generals concerned. The Group believes that a core element of any software strategy must involve enhanced efforts to promoting High-tech Education and ICT Skills Capacity to stimulate greater innovative creativity within individuals, including promoting e-skills, maintaining and enhancing existing technical capacity, and promoting innovative talent. Specifically, e-skills are essential to maintain and to raise European productivity and to deliver on the ambitious Green ICT goals.

In cooperation with and in support of related initiatives<sup>2</sup>, and to contribute to a comprehensive and effective Software Strategy in Europe, the DG Information Society and the Commission as a whole should continue to support the activities of the European Commission "e-Skills Forum"<sup>3</sup> and to enhance the following European ICT skills initiatives:

- *The "European e-Skills Career Portal" as presented at the EU e-Skills Conference, October 2008 in Thessaloniki (<http://eskills.eun.org/web/guest/home>)*
- *The "European e-Competence Framework" ([www.ecompetences.eu/](http://www.ecompetences.eu/)), aligned to market needs and industry-based ICT credentials and certifications*
- *The "European Alliance on Skills for Employability" ([www.e-skills-ilb.org/alliance/default.aspx](http://www.e-skills-ilb.org/alliance/default.aspx))*
- *Innovative education and lifelong learning processes through ICT multi-stakeholder partnerships with industry and the "European Institute for Innovation and Technology" ([http://ec.europa.eu/eit/mission\\_en.htm](http://ec.europa.eu/eit/mission_en.htm))*

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<sup>1</sup> David Chappell, A Short Introduction to Cloud Platforms, An Enterprise-Oriented View (August 2008) (cloud computing refers to a 'new way of supporting applications' through on off-premises platform, namely through the internet 'cloud').

<sup>2</sup> For example the work by the European Economic and Social Council/EESC "Study Group TEN 364" on "Education and training needs for the carbon-free energy society" ([www.toad.eesc.europa.eu/EESCBrowseDocuments.aspx](http://www.toad.eesc.europa.eu/EESCBrowseDocuments.aspx))

<sup>3</sup> For the e-skills activities of DG Enterprise and Industry and the "European e-Skills Forum", see: <http://ec.europa.eu/enterprise/ict/policy/ict-skills.htm> and <http://communities.trainingvillage.gr/esf> and [http://webcast.ec.europa.eu/dgenttv/portal/\\_vi\\_wm\\_300\\_en/player/index\\_player\\_documentary.html?id=5758](http://webcast.ec.europa.eu/dgenttv/portal/_vi_wm_300_en/player/index_player_documentary.html?id=5758)

- *The e-Inclusion and 'Women and ICT' agenda* ([www.e-skills-ilb.org/docs/e-Skills-ILB\\_newsletter\\_SEP08\\_v08\\_LR.pdf](http://www.e-skills-ilb.org/docs/e-Skills-ILB_newsletter_SEP08_v08_LR.pdf))
- “European Green ICT Skills and Software” initiatives during the “**European e-Skills Awareness Campaign 2009-2010**” as well as the “**e-Skills Week**” at the CeBIT 2010, in March 2010
- “European lead initiative on e-Skills and Green ICT software capacities at the “**UN Climate Change conference 2009**”, in Nov- Dec. 2009, in Copenhagen.”<sup>4</sup>

### High-tech Education and ICT Skills Capacity Building

The global economy, and particularly Europe’s advanced marketplace, is increasingly dependent on ICT and software in particular. A dual economic dependency on the software industry in Europe has emerged. Today Europe depends on its ability to **supply or produce** technology as European production of software increases, comprising nearly one-third of the European ICT market. Europe also depends on **demand or use** of technology for greater economic productivity. As Commissioner Viviane Reding noted in a speech before European software leaders, “*The main significance of software is that it is everywhere. Today everything depends on software: all the internet and telecommunications services; all machines from giant power stations, through advanced jet planes down to the simplest coffee percolator, all run on software.*”<sup>5</sup>

**Knowledge based industries require skilled employees.**<sup>6</sup> In this environment, the continued competitiveness of Europe becomes more reliant on the availability of a workforce properly trained in e-skills. A shortage of e-skills not only prevents the adoption of new technologies, it also hinders the use and consolidation of existing ICT systems, resulting in major inefficiencies

**“Digital literacy and media literacy as well as professional e-skills are crucial enablers that allow EU citizens to exploit the full potential of the information society.”**

Source: 2008 e-skills ILB Policy Declaration  
[www.e-skills-ilb.org/docs/e-Skills\\_ILB\\_Policy\\_Declaration\\_2008\\_final\\_22\\_Feb.pdf](http://www.e-skills-ilb.org/docs/e-Skills_ILB_Policy_Declaration_2008_final_22_Feb.pdf)

and wasted resources. Demand for high end ICT network skills to plan and implement internet technology in support of business processes is particularly acute. The continuing growth of desktop applications and mobile working environments means the demand for ICT skills in these areas of distributed computing is also high.

Furthermore, digital literacy and professional e-skills are crucial enablers that allow countries and their citizens to exploit the full potential of the information society. As Europe’s economy becomes

increasingly ICT-dependent, digital illiteracy substantially reduces the opportunities available for participation in the labour market.

<sup>4</sup> See: [www.erantis.com/events/denmark/copenhagen/climate-conference-2009/index.htm](http://www.erantis.com/events/denmark/copenhagen/climate-conference-2009/index.htm)

<sup>5</sup> “Towards a European Software Strategy”, speech before Truffle 100; Brussels 19 November 2007. Commissioner Viviane Reding, Commissioner for Information & Media.

<sup>6</sup> For Commissioner Reding’s e-skills video message at the WSIS in Tunis 2005 see: [www.e-skills-ilb.org/docs/STU2\\_Reding\\_ESKILLS.mpg](http://www.e-skills-ilb.org/docs/STU2_Reding_ESKILLS.mpg) or [www.e-scc.org/documents\\_resources/default.aspx](http://www.e-scc.org/documents_resources/default.aspx)

In addition, it is important to recognise that e-skills shortages are a global phenomenon. Europe's competitors also are finding it difficult to keep up with demand for their services. In this market, it may make sense to focus policy efforts less on 'competition by comparison' (i.e. 'us versus them') and more on promoting domestic capacity. Indeed, the risk increasingly is less that a highly skilled job will move offshore and more that there will be no qualified engineer anywhere in the world to fill it!

The good news is that several European Institutions and various Commission services are deeply involved in e-skills promotion and have been for some time.<sup>7</sup> Our analysis and recommendations below reflect the current debate in Europe, reiterate existing policy recommendations, support existing policy steps taken by European policy officials, and highlight a few new issues for consideration.

The Working Group believes these considerations can be structured into three major areas:

- (1) Promoting general e-skills and lifelong ICT learning among the labour force***
- (2) Enhancing innovative talent capable of managing and expanding Europe's existing software capacity, and***
- (3) Fostering innovative solutions and capacity building through multi-stakeholder partnerships and enhanced business-university cooperation.***

### **Challenge 1: Promoting general e-skills and lifelong ICT learning among the labour force**

A lag in digital uptake is not without parallels in historical economic patterns of innovation uptake, such as with the agricultural revolution or industrialisation. However, the technology revolution has propelled an unprecedented level of *speed of change* on the economy. With that speed comes many challenges, some of which are not being met. In this revolution, the difference is not access to infrastructure alone, it is more than ever the human element. Knowledge, skills, and thought processes will make the difference in the technology revolution. If the European labour force fails to keep pace, there is a risk that basic employment will move offshore. Indeed, according to one OECD finding, a total of 20% of current employment could be replaced by ICT-enabled off-shore outsourcing. Unfortunately, according to Eurostat research, only 22% of European households have 'high' levels of basic computer skills and 37% have 'no basic computer skills'.<sup>8</sup> Not surprisingly, the level of e-skills diminishes as levels of education diminish. In addition, statistically e-skills are inversely related to age.

Thus, e-skills are fundamental for the development of productivity and knowledge intensive products and services. In a knowledge-based economy, ICT uptake and acquiring, generating and exploiting knowledge are key determinants of success for enterprises and individuals.

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<sup>7</sup> See for example the bi-annual European e-Skills conferences, organised by DG Enterprise and Industry, in cooperation with CEDEFOP, and other Commission services, <http://eskills.cedefop.europa.eu/conference2008/>

<sup>8</sup> Eurostat research on e-Skills of individuals, [http://epp.eurostat.ec.europa.eu/portal/page?\\_pageid=1996,45323734&\\_dad=portal&\\_schema=PORTAL&screen=welcomeref&close=/t\\_isoc/t\\_isoc\\_sk&language=en&product=REF\\_TB\\_information\\_society&root=REF\\_TB\\_information\\_society&scrollto=0](http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&close=/t_isoc/t_isoc_sk&language=en&product=REF_TB_information_society&root=REF_TB_information_society&scrollto=0)

The good news is that the European Commission has identified this challenge, invested resources in identifying solutions, and prioritised the issue. In its 7 September 2007 Policy Communication “E-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs”, it stated:

- *“It is crucial ... to rapidly adopt a long-term e-skills agenda to promote competitiveness, employability and workforce development, reduce e-skills gaps and be in a better position to address global competitive challenges” ....*
- *“Strong efforts need to be made to improve co-operation between the public and private sectors, on a long-term basis, in order to ensure a seamless framework linking basic e-skills training, vocational and higher education and professional development”....*
- *“Industry and policy makers should act more decisively and consistently regarding their strategies to promote the professionalism, image and attractiveness of ICT jobs and careers and to foster better employment conditions and perspectives”.*<sup>9</sup>

These same skills challenges are being felt world-wide. As Europe improves the basic technical capacity of its labour force, so are other economies world-wide. The US Competitiveness agenda as well as the recent ‘US Stimulus Package’ includes strong emphasis on technology skills in the labour force. Korean and Japanese governments continue to emphasise math and science skills. *“Countries from Ireland to India to China have spent decades doing their homework - investing wholeheartedly in technically educated workforces....”*<sup>10</sup>

One good case study is right here in Europe - Ireland. The Irish economy continued to thrive due in part to Ireland’s unique workforce. According to the Irish Development Authority (IDA), one of the major positive factors in Ireland’s success has been that it has one of the highest educational participation rates in the world. Thirty-seven percent of the Irish population now achieves at least tertiary (university) education. Having helped to lead the economy of Ireland to its globally prominent position, the government continues to believe that its policy on investment in research and ‘4th level’ education are key to Ireland’s continued development as a knowledge society in the new global economy.<sup>11</sup> The importance of ICT skills is further documented in domestic competitiveness studies showing that Ireland’s productivity growth is greatly influenced by the skills and knowledge of its workforce.<sup>12</sup>

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<sup>9</sup> See Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, “E-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs”, 7 September 2007, p. 3, [http://ec.europa.eu/enterprise/ict/policy/doc/COMM\\_PDF\\_COM\\_2007\\_0496\\_F\\_EN\\_ACTE.pdf](http://ec.europa.eu/enterprise/ict/policy/doc/COMM_PDF_COM_2007_0496_F_EN_ACTE.pdf) or [www.e-skills-ilb.org/docs/European%20Commission%20e-Skills%20Communication.pdf](http://www.e-skills-ilb.org/docs/European%20Commission%20e-Skills%20Communication.pdf)

<sup>10</sup> “An Innovation Nation Once More” by Todd Pittinsky, [www.csmonitor.com/2008/0915/p09s03-coop.html](http://www.csmonitor.com/2008/0915/p09s03-coop.html)

<sup>11</sup> Education Ireland 2007

<sup>12</sup> According to the case study Productivity: Ireland's Economic Imperative—A Study of Ireland's Productivity Process and the Implications for Ireland's Future Economic Success, an important component of technology adaptation in Ireland’s leading business sectors was education levels and training. - These four leading manufacturing segments invest much more heavily than the rest of industry. This includes investment in, and applications of, Information and Communication Technology (ICT) and also training. Without these four leading manufacturing segments, average productivity levels throughout the Irish economy would be much lower and the pace of productivity growth over the past decade would have been much slower. Business 2000, 2007

***What is needed? Public Policy Recommendations to Promote General e-Skills. Implement Existing Industry Recommendations<sup>13</sup>, the European e-Skills Forum & the Recommendations of the ICT Task Force and the European Commission.*** EU officials already have developed strong analysis and recommendations in the e-Skills area. At this stage, we believe it is necessary to support existing efforts from the many committees and recommendations already made, including the European e-Skills Forum, the ICT Task Force Report, the European Commission's Communication on "e-Skills for the 21st Century, Fostering Competitiveness, Growth and Jobs" (September 2007) and the Competitiveness Council Conclusions on "A Long-Term Strategy for e-Skills" (November 2007), among others. This Long Term Strategy focuses mainly on four key areas, notably on motivating and empowering future generations with e-skills, promoting ICT practitioner education and training, boosting the employability of the workforce with ICT user skills and providing foresight and support for future skills needed in the changing environment. The Working Group welcomes and strongly supports this action plan on ICT skills. In short, there is strong consensus on e-skills development in Europe. What is required now is action.

We also applaud the European Commission for recognizing the persistent problem of digital illiteracy in both the Communication, but also through its monitoring and research. We agree that the ambitious goal of digital literacy will not be reached by itself. Europe needs a long term e-Inclusion strategy to avoid the risk of marginalizing 30-50% of European population and the Communication represents an important step in this direction. In this respect we would especially like to single out the call to bring the industry-based and formal education closer together. If we want e-skills to be disseminated throughout the population, we need to pursue more flexible approaches to learning, bridging the different interests of industry, governments and of all stakeholders concerned in order to achieve this common goal.

We believe one of the most important concepts from these discussions is something summarised as '*access to access.*' Throughout the entire '*Training-employment Value Chain*', from *access* to technology and physical infrastructure in schools, *access* to training and content, curricula and certifications, *access* to public funding, and finally *access* to labour placements, each is key.<sup>14</sup> Each of these elements needs to work in tandem or the cycle simply doesn't work.

For example, increased access to technology in the learning environment not only enables new ways to teach, it excites an essential curiosity of children that ensures students are able to develop ICT skills. Indeed one of the barriers often cited by older adults in accessing technology is fear of damaging the computer or lack of familiarity with basic concepts. A computer in every classroom is critical.

But, while innate curiosity can propel comfort and creativity with computer technology, next step learning and critical innovative skills require training. The notion, perpetuated in some studies, that skills training is unnecessary, is simply incorrect. Skills training is unnecessary for example in FLOSS in the same way it would be unnecessary as a child teaches itself how to use

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<sup>13</sup> [www.e-skills-ilb.org/docs/e-Skills\\_ILB\\_Policy\\_Declaration\\_2008\\_final\\_22\\_Feb.pdf](http://www.e-skills-ilb.org/docs/e-Skills_ILB_Policy_Declaration_2008_final_22_Feb.pdf); see below footnote 14

<sup>14</sup> *Ibid.*, The 2008 e-Skills ILB Policy Declaration, p. 2

Adobe Photoshop or to build his own page on Facebook. But, that is ‘training’ to e-Skills. Training to innovate is something different. Whether it is formal or informal, it is necessary to achieve the next level of software generation, ‘software as services’ development or ‘cloud computing’ or others.

Similarly, public funding to help facilitate access, as well as assistance in placing qualified labour helps to complete the training employment value chain.

Working in detail on the “*access-to-access*” concept, the “e-skills Industry Leadership Board” (ILB), in conjunction with EU bodies and other institutional actors, had developed in 2008 a set of critical recommendations in this area, and had called upon policy-makers, European citizens and relevant stakeholders to build on tested best practices and to highlight the role of multi-stakeholder partnerships to provide sustainable ICT training and industry-based qualification schemes, recognized credentials and certifications <sup>15</sup>.

**Focus Group Key Recommendations to Promote General e-Skills and Lifelong ICT Learning among the Labour Force:**

- **Implement numerous European Commission and industry recommendations in the e-Skills area**
- **Ensure access to critical infrastructures to fostering lifelong learning for ICT skills**
- **Adopt tax breaks for companies that invest in education for their employees**
- **Ensure ‘*access to access*’ throughout the entire ‘Training-Employment Value Chain’, including access to technology and physical infrastructure in schools, access to training and content, curricula and certifications, access to public funding, and finally access to labour placements**
- **Recognize ICT skills value credentials and support industry-based ICT skills certifications to keep European software industries competitive.**

**Challenge 2: Enhancing innovative talent capable of managing and expanding Europe’s existing software capacity**

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<sup>15</sup> For the ILB Recommendations see p. 3 of the “Policy Declaration 2008, e-Skills Competencies - Actions Towards Sustainability”. Recommendations to European Institutions, Governments, Industry and Other Stakeholders Concerned”, submitted to the European Council of Ministers in Brussels, 13-14 March 2008, [www.e-skills-ilb.org/docs/e-Skills\\_ILB\\_Policy\\_Declaration\\_2008\\_final\\_22\\_Feb.pdf](http://www.e-skills-ilb.org/docs/e-Skills_ILB_Policy_Declaration_2008_final_22_Feb.pdf).

It goes without saying that in production of a knowledge based product such as software, the most essential asset is human capacity. The capacity to develop and sustain human talent in the software field is critical. According to the European Software Association, “*In Germany alone the skills shortage is costing the economy up to €20bn a year, or 1% of GDP, according to a study recently commissioned by the German Economics Ministry.*”<sup>16</sup> So, what barriers are impeding and what factors are impacting Europe’s ability to produce a skilled labour pool? Among the key challenges are, the absence of basic ICT skills education across Europe, inadequate number of university graduates in this area, lack of awareness and recognition of industry-based credentials, lack of lifelong ICT learning programmes, and perception of foreign competition.

*“As the global economy has become more complex, it has become evident that to compete and maintain a presence in global markets it is essential to boost the human capital endowments of the labor force, whose members must have access to new knowledge, be constantly trained in new processes and in the operation of the latest technologies.... The importance of vocational and continuous on-the-job training, neglected in many economies, cannot be overstated, as it increases the efficiency and productivity of each worker.”*

WEF Nov. 2006

***A rethink of educational structures is required.*** Given the pace of technological change, simple technical training is not appropriate to produce innovative capacity. Further, educational styles which teach rote learning, rather than fostering creative dynamics in school, are inadequate to give new engineers the power to think non-linearly or linearly depending on the need. In addition, the Eurostat data identified large ICT skills gaps between highly educated (only 11% with no basic computer skills) versus poorly educated (61% with no basic computer skills). With that variance in statistics and the stated European objectives of more aggressively bringing in under-represented groups, a series of scholarships for basic level maths and science education may be useful. Under-privileged or lower-income individuals could thus access better educational institutions.

***Incentivise university level graduation in computer engineering.*** There are simply too few technical graduates graduating. This means a dual effort to promote more interest among young people in these fields is critical, along with increasing immigration for highly skilled workers. As the World Economic Forum (WEF) consistently has highlighted education is a critical ingredient of competitiveness. The quality of science and mathematics education, management training and specialised e-skills training for the workforce is vital to achieving the economic benefits of ICT use.

***Foster access to lifelong learning.*** The need to constantly upgrade skills has been recognised by the Commission as critical to improving Europe’s competitive capacity. Given the fundamental importance of this recommendation, it bears further mention here. Companies find new graduates unable to fulfil essential technical roles. Indeed, as with doctors and lawyers,

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<sup>16</sup> European Software Association, “European Software Industry: Looking for a Competitive Advantage”, June 2007, p. 6

technical engineers must engage in life-long learning programmes. European businesses recognise the challenge and are concerned. *“75% of the respondents in a survey across 10 European countries believe that the level of ICT skills of their employees will influence the competitiveness of their organisations, its ability to innovate and its ability to grow.”*<sup>17</sup>

***The role of multi-stakeholder partnerships is essential.*** Part of the challenge with inadequate educational structures comes fundamentally to the speed with which technology changes. Human capacity must be fostered to drive change rather than hinder it. While some of this can happen through modifications to the educational system and increased math and science capacity, there is only so much a non-technology dedicated institution can do. Yet, dynamism and new approaches in skills training is essential. To supplement, it is essential there be close co-operation between all stakeholders concerned. That may mean enhanced partnerships between university and private sector institutions as envisaged under the ‘Bologna Process’. It may mean more ICT specific training centres. Or, it may mean investment by individual companies to promote the greater welfare of the industry by augmenting its technical capacity.

The Commission clearly has recognised the value of public-private or multi-stakeholder partnerships in developing e-Skills. Further, the Commission has thoroughly analyzed the situation with respect to public-private partnerships throughout Europe in the findings of “Multi-stakeholder Partnerships for e-skills in Europe”<sup>18</sup>. We concur with Commission findings and encourage full implementation and ongoing research in this area to support the growth of multi-stakeholder partnerships for ICT education and training.

***Foreign resources are a lifeline, not a threat:*** European leaders are fully aware of foreign competition in the software field. Given the globalisation of the sector, however, it may be necessary to rethink our perspective on foreign talent. Indeed, increasingly foreign talent is an advantage to be leveraged by European companies, rather than as a replacement for European talent. In this globally competitive environment, the only way for European industry to compete is by leveraging the best and brightest *globally*. This may require a complete rethinking of what is considered a ‘national’ or a ‘European’ industry, given how fundamentally global every aspect of the software industry is. For example, a company could have 20 engineers on staff in Berlin, 5 Indian nationals, 5 Chinese nationals, and 10 German nationals, working on a piece of software code that is transferred to Manila for work during Berlin’s evening. The code probably originated from another work product developed by engineers with a mix of nationalities. Similarly, one of the many ICT companies manufacturing in Ireland, would employ European talent, as well as non-European talent. But, all those jobs are equally European in that they contribute to European productivity, to the European economy, and to European based innovations.

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<sup>17</sup> “e-Skills - The Key to Employment and Inclusion in Europe”, IDC Whitepaper, January 2007. European Software Association paper, *ibid.*, quote p. 7

<sup>18</sup> Benchmarking Policies on Multi-Stakeholder Partnerships for e-skills in Europe, Dec. 2007, [www.e-skills-ilb.org/docs/Benchmarking%20MSPs%20final\\_report\\_final.pdf](http://www.e-skills-ilb.org/docs/Benchmarking%20MSPs%20final_report_final.pdf)

Access to foreign engineering talent compliments and strengthens existing European talent. Competition from emerging markets drives European producers to be more competitive and to link up strategically with complimentary technology. Large established multinational players provide much needed research budget, access to technology, and large economic impacts in the European ICT ecosystem. European industry because it already is strong, vibrant, and competitive has itself managed these challenges and turned them into very successful economic and innovative stimulants. Ownership, nationality, location - these terms increasingly are irrelevant in the technology sector.

Importantly as well, this challenge is not limited to Europe. From India to the US, the availability of qualified engineering talent is in crisis. Indeed, while discussions centre on fears of foreign dominance, in truth, all countries are struggling to keep up the numbers of qualified engineers. The US and Japan consistently lament the lack of qualified engineers. Increasingly, major human capacity source suppliers, such as India are also feeling the crunch of global demand. Indeed a few years ago, India's lead software association NASSCOM issued a study showing a greater than 200,000 person engineering shortfall. Further, these countries are themselves increasingly trying to attract the world's best and brightest. For example, India's Department of Biotechnology/DBT and the British charity Wellcome Trust are sponsoring a €100 million fellowship for up to 375 scientists. *"Our goal is to attract individuals who can go on to become leaders of India's growing biomedical research enterprise,"* says S. Natesh, a senior adviser to DBT.<sup>19</sup>

With the global supply of engineering talent shrinking, the issue of raising European talent becomes more complex. Not only does Europe have to produce more engineers, it must sustain existing talent, retain talent, and raise the bar for attracting increasingly scarce foreign talent.

### **Software Development and Management Skills**

With the ever increasing use and reliance on high-technology and constant development of software applications across the ICT-embedded economy and society as whole, professional capacities in software development and engineering, in management and to go-to-market capabilities will be widely required in all areas of business and industry, with a special emphasis on the growing service-providing sectors of the global economy: *"The world economy is experiencing the largest labor force migration in history. Driven by an environment that includes global communications, business growth and technology innovation, services now account for more than 50 percent of the labor force in Brazil, Russia, Japan and Germany, as well as 75 percent of the labor force in the United States and the United Kingdom."*<sup>20</sup>

Moreover, *"ICT is an essential driving force for innovation and a core enabler of economic growth in the coming years. Enterprises in Europe (both in the private and the public sector) are facing significant structural changes and will rely on software and services to support them in adapting effectively."*<sup>21</sup> [...] *this shift to focusing on services has created a gap in skills, especially*

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<sup>19</sup> "India Hopes New Fellowships Will Attract Expat Scientists", Yudhijit Bhattacharjee, Science Magazine, 12 September 2008, [www.sciencemag.org/cgi/content/full/321/5895/1431a](http://www.sciencemag.org/cgi/content/full/321/5895/1431a)

<sup>20</sup> Services Sciences, Management and Engineering, [www.research.ibm.com/ssme/](http://www.research.ibm.com/ssme/)

<sup>21</sup> Networked European Software and Services Initiative, [www.nessi-europe.eu/Nessi/](http://www.nessi-europe.eu/Nessi/)

*in the area of high-value services, which requires people who are knowledgeable about business and information technology, as well as the human factors that go into a successful service operation”.*<sup>22</sup>

These business, marketing, sales and project management skills are a key enabler for the health, growth and competitiveness of the software industry in Europe. Therefore, through the whole business value-chain, a clear understanding and mastering of ICT as the backbone of business processes and as a catalyst for productivity and competitiveness of undertakings will become instrumental.

Mastered efficiently these software development and management skills will result in a significant competitiveness advantage. The Working Group therefore supports the proposal made by several EU Member State ICT Industry Associations for the establishment of a “European Software Expertise Network” (ESEN)<sup>23</sup>.

**Focus Group Key Recommendations to Enhance Innovative Talent Capable of Managing and Expanding Europe’s existing Software Capacity:**

- **Rethink approaches to education, emphasising creativity rather than rote learning**
- **Emphasise basics in education**
- **Consider EU-funded scholarships for underprivileged individuals to supplement basic educational learning in key ICT areas**
- **Consider EU-funded university scholarships for ICT skills and software engineering degrees in cooperation between industry and universities**
- **Foster life long learning through multi-stakeholder partnerships**
- **Ease access to Europe’s market for highly skilled engineering talent**
- **Provide incentives for companies, in particular SMEs, that conduct training, R&D and other software related innovation and human capacity investment**
- **Establish a “European Software Expertise Network” (ESEN) to enhance ICT skills capacities in software development and engineering, in management and to go-to-market capabilities.**

**Challenge 3: Fostering innovative solutions and capacity building through multi-stakeholder partnerships and enhanced business-university cooperation**

In promoting human capacity, Europe should be looking not just at the ability to compete, but also at the ability to innovate, including social innovation in the key area of ICT education and training itself, which requires stronger co-operation among the main stakeholders concerned.

<sup>22</sup> Services Sciences, Management and Engineering, [www.research.ibm.com/ssme/](http://www.research.ibm.com/ssme/)

<sup>23</sup> For details on the ESEN project, see: [www.ictoffice.nl/index.shtml?id=6455](http://www.ictoffice.nl/index.shtml?id=6455)

Many of the recommendations outlined above will foster that capacity. In addition, it is important for policy makers to consider the role that other aspects of public policy may have on innovative skills development. By promoting or funding only one type of technological development, talent is increasingly pulled from existing technical capacity and experimental capacity. This could draw talent away from new concepts, ideas, and software platforms.

The concept of technology neutrality should extend equally to technology skills as it does to other aspects of the technology sector. Government public policy should focus on promoting fundamental and professional ICT skills that provide the framework for general technology development and technology use. Where specific technical talent is to be funded, government funding should be generally available to all technology options. Specific technical development should come largely through multi-stakeholder partnerships, and industry-led skills training programmes.

***The balance between informal and formal is just as critical with respect to technical standards in general as it is with respect to e-skills standards in particular.*** ICT digital literacy, and professional training, e-skills credentials and industry-based certifications, proprietary or open source, are part of a much wider policy debate in Europe that is facing similar topical issues as the general standards debate. Ironically, it seems that the ICT digital literacy and professional e-skills discussion, similar to the general policy debate on technical standards, is being engulfed in the notion of mandatory formal ‘European quality standardisation’ by some policy initiatives.

Specifically there is a question of whether to rely on formal or informal training and certification systems and whether best practices of tested informal delivery of global industry-based e-skills standards and certifications have to be aligned to European quality criteria under discussion.<sup>24</sup> As with the issue of technical and software standards, the issue of e-skills standards is not an either-or question. It is not a choice simply of formal or informal standards and certification. There are a large range of opportunities available from company specific certifications, proprietary and open source, to technology and product neutral associations to government institutions. The real challenge here is for cooperation and close consultation to align European e-Competence Frameworks and similar reference schemes under preparation as close as possible to real market needs and recognized value credentials.<sup>25</sup>

Historically, ICT certifications were developed by professional societies, such as the Institute of Electrical and Electronics Engineers (IEEE), to help self regulate. But, subsequently, companies discovered the value of creating their own certification processes to help promote efficiency with product use.

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<sup>24</sup> See CEPIS, “Survey of Certification Schemes for IT Professionals across Europe towards Harmonisation”, Final Report, 3 Sept. 2008, at: [www.cepis-harmonise.org/harmonise/php/index.php?id=6](http://www.cepis-harmonise.org/harmonise/php/index.php?id=6), [www.cepis-harmonise.org/harmonise/php/index.php?id=13](http://www.cepis-harmonise.org/harmonise/php/index.php?id=13), and the full report of some 300 pages: [www.cepis-harmonise.org/harmonise/php/uploads/media/20080903\\_harmonise\\_final\\_report\\_v1\\_1\\_01.pdf](http://www.cepis-harmonise.org/harmonise/php/uploads/media/20080903_harmonise_final_report_v1_1_01.pdf).

<sup>25</sup> For one of the industry offerings in this regard see the “CompTIA EU Certification Roadmap” under discussion by the CEN/ISSS ICT Certification workshop ([www.e-skills-ilb.org/docs/CompTIA\\_Cert%20Road%20Map\\_EU%20FINAL.pdf](http://www.e-skills-ilb.org/docs/CompTIA_Cert%20Road%20Map_EU%20FINAL.pdf))

*“Novell, commonly credited as the firm that permanently changed the ICT certification landscape, initially created their Certified Network Engineer (CNE) certification programme to supplement an over-burdened technical support function. It served as a first line of defence against common networking problems. However, the programme evolved to become part of an initiative to literally ‘entrench’ Novell’s products among a highly targeted group of purchase-decision influencers. In this initiative, certification became a means for stratifying distribution channels based on their competency. Once it recognised the benefits of Novell’s use of certifications, Microsoft soon joined the fray with its MCP programme. Similarly, Cisco set up Cisco Career Certifications. The success of vendor-specific certifications, in turn, spurred most major ICT firms to establish their own certification programmes. By the late 1990s, over 300 vendor specific certifications were being offered by software and hardware firms. Vendor-neutral certifications, on the other hand, rapidly gained momentum starting in the mid 1990s.”<sup>26</sup>*

*“Certifications of ICT professionals has to be seen as part of a broader issue, namely the establishment of recognised standards for the international ICT profession.”*

**Source: “Survey of Certification Schemes for IT Professionals across Europe towards Harmonisation” p. 6, CEPIS September 2007:**

[www.cepis-harmonise.org/harmonise/php/index.php?id=6](http://www.cepis-harmonise.org/harmonise/php/index.php?id=6), and [www.cepis-harmonise.org/harmonise/php/index.php?id=13](http://www.cepis-harmonise.org/harmonise/php/index.php?id=13)

It has to be noted that ICT certifications are not only related to proficiency in product usage, but also on the knowledge of diverse aspects related to ICT and associated processes. Indeed, there is a large number of certifications related to ICT business and management aspects in a broader sense, such as ‘Project Management Professional’ from the Project Management Institute, ‘Control Objectives for Information and related Technology’ from the IT Governance Institute, ‘Certified Information Systems Auditor’ from ISACA, ‘Capability Maturity Model Integration’ from the Software Engineering Institute, or the ‘Information Technology Infrastructure Library’ from the ITIL Certification Management Board, just to give some examples.<sup>27</sup>

This development of multiple standards organisations has led to a divergence of skills against specific technology demands. For example, “According to one estimate, 600 million RFID tags were sold in 2005 alone and the number of tags delivered in 10 years will be over 450 times the number actually to be delivered this year....Yet, a 2007 CompTIA survey showed that there are fewer than 1,000 qualified ICT professionals available world-wide who understand and know enough to deploy and service RFID technology.”<sup>28</sup>

<sup>26</sup> Hugo Lueders, “E-Skills Competences in Europe: A Partnership to Deliver Sustainable Value”, UPGRADE Vol. VIII, No. 3, June 2007, p 7, [www.upgrade-cepis.org/issues/2007/3/up8-3Lueders.pdf](http://www.upgrade-cepis.org/issues/2007/3/up8-3Lueders.pdf).

<sup>27</sup> For an overview and a ‘roadmap’ of industry-based ICT certifications, see: <http://tcc.comptia.org/certifications.aspx> and [www.e-skills-ilb.org/docs/CompTIA\\_Cert%20Road%20Map\\_EU%20FINAL.pdf](http://www.e-skills-ilb.org/docs/CompTIA_Cert%20Road%20Map_EU%20FINAL.pdf); for the certs mentioned, see: Project Management Institute [www.pmi.org](http://www.pmi.org); IT Governance Institute [www.itgi.org/](http://www.itgi.org/); ISACA [www.isaca.org/](http://www.isaca.org/); Software Engineering Institute [www.sei.cmu.edu/](http://www.sei.cmu.edu/); ITIL Certification Management Board [www.ital-officialsite.com](http://www.ital-officialsite.com)

<sup>28</sup> Ibid., Lueders, p. 8

But it is not just the industry predilection to drive training on its own products or management procedures that propels this imbalance. In addition, formal training and educational institutions often fail to provide proper education for e-skills and for technical engineering talent and management up to the value credentials required by business undertakings and to meet the needs of market demand. *“E-Skills, business sector certification and training continue to occupy an entirely separate domain from public sector education policy. Groups including the European e-Skills Forum and the European Commission’s ICT Task Force have warned of ‘parallel universes’ arising between industry-based and formal government-supported education in ICT.”*<sup>29</sup>

One thing is certain, ICT skills training, like ICT technology development, is dynamic and rapidly changing. Any work in this field requires close co-ordination among all relevant players. Government sponsored training on its own will naturally fail to respond to the rapidly changing market. Private certifications alone will not meet existing demand. ***In this environment, government should maintain a careful partnership with the business and training sectors and with independent organisations. Multi-stakeholder partnerships that drive credential value, communication and greater awareness are critical.***

In this rapidly changing environment, it does not make sense for government to act alone, ‘top down’, with respect to developing innovative capacity. It does not make sense to specifically define ‘formal’ and ‘informal’ certifications or e-Skill standards, or to differentiate between them as to their merits. What does make sense is co-operation and partnership.

### **Enhanced Business-University Cooperation – the University 2.0 Phenomena**

The needs of an institutional change at European universities through the ‘Bologna Process’ to adapt to the requirements of the software-based networked and knowledge economy is widely recognized.<sup>30</sup> On the way to a knowledge-based society and improved mastering of software development and application skills, a process of transforming European universities for enhanced business-university cooperation and lifelong ICT learning is undertaken. As it was reported:

*“Universities are, at their core, organizations that cultivate knowledge, seeking both to create knowledge and to preserve and convey knowledge, but they are remarkably inefficient and therefore ineffective in the way that they leverage their own information resources to advance that core activity”*<sup>31</sup>

To substantially improve STEM education, software development and managerial skills in Europe and to meet the fast changing demand of software skills to serve consumer needs, enhanced cooperation between universities and ICT business is considered as a strategic goal.

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<sup>29</sup> Ibid., Lueders, p.8; good examples of how to bridge this disconnect through traditional learning institutions partnering and cooperating with industry are given by John O’Sullivan “CEN/ISSS Workshop on ICT-skills e-Certification in Europe”, at: [www.e-skills-ilb.org/docs/John%20O’Sullivan\\_ILB\\_CC\\_Brussels\\_21oct08.ppt#256](http://www.e-skills-ilb.org/docs/John%20O’Sullivan_ILB_CC_Brussels_21oct08.ppt#256), slide 8

<sup>30</sup> For e-skills in the public sector and the “Bologna Process”, see the ILB Newsletter, September 2008, at: [www.e-skills-ilb.org/docs/e-Skills-ILB\\_newsletter\\_SEP08\\_v08\\_LR.pdf](http://www.e-skills-ilb.org/docs/e-Skills-ILB_newsletter_SEP08_v08_LR.pdf)

<sup>31</sup> Unsworth, J., “University 2.0”, in: R.N. Katz (ed.), “The tower and the cloud: higher education in the age of cloud computing”, pp 227-237, educause 2008

Through this process the traditional European university concept gradually evolves towards a “University 2.0” model, which integrates ICT and software skills in all university activities, including the ones related to the outside and surrounding software and knowledge intensive Undertakings.<sup>32</sup> This trend towards a University 2.0 model to leapfrog ICT and software culture and skills should be recognized and supported. The virtual space of a University 2.0 emerges as the framework for universities to adapt to the social computing phenomena and the networked information economy. In this virtual space the academic and the business worlds will establish for the benefit for the European software interests needed associative partnerships.

This development deserves to be strengthened through a continuous European awareness campaign on high-tech STEM education capabilities and ICT careers opportunities in Europe, such as the new release of the “Erasmus Mundus” programme (2009-2013), which is a co-operation and mobility programme in the field of higher education to promote the European Union as a worldwide centre of excellence in high-tech learning.<sup>33</sup>

These ERASMUS<sup>34</sup> and other programmes, like the EUREC ‘Master Degree for Renewable Energy’<sup>35</sup> allow the creation, support and promotion of much needed European academic qualifications in the field of ICT. The Work Group recommends that the European Commission should, as part of the “European Software Strategy”, strengthen similar academic skills initiatives in the ICT and software area and, accordingly, the European Union should strive to ease as much as possible the access of non-EU students to these EU high-tech education programmes.

This promotion of European educational capabilities and academic ICT career opportunities, requires also the support of the corresponding pan-European recognition of the quality of the various university ICT degrees through a formal EU accreditation system:

#### Hewlett Packard and Bulgarian universities partner on boosting ICT skills

HP Bulgaria has partnered with the University of Sofia, the Technical University and the New Bulgarian University on programmes to boosting ICT skills of ICT and engineering graduates. Together the universities and HP Bulgaria have offered specially designed teaching modules to help ICT and engineering students to acquire some specific and updated skills in line with market demand. One of the advantages of the programme is that it combines lectures with lab exercise.

The initiative has improved the employability of the ICT students and HP Bulgaria has benefitted from the programme by establishing contacts with potential employees.

*source: HP Bulgaria 2008*

<sup>32</sup> Roumen Nikolov, “Towards University 2.0: a space where academic, education meets corporate training”, in: “IPROF-09, ICT Professionalism: a Global Challenge”, 12-15 Feb. 2009, University of Arnhem and Nijmegen, Netherlands

<sup>33</sup> Erasmus Mundus (2009-2013), [http://ec.europa.eu/education/external-relation-programmes/doc72\\_en.htm](http://ec.europa.eu/education/external-relation-programmes/doc72_en.htm)

<sup>34</sup> Erasmus Mundus - Selected projects, Nationality of selected scholarship grantees [http://ec.europa.eu/education/programmes/mundus/projects/comp06\\_en.pdf](http://ec.europa.eu/education/programmes/mundus/projects/comp06_en.pdf)

<sup>35</sup> EUREC, “European Master in Renewable Energy”, [www.master.eurec.be/](http://www.master.eurec.be/)

*“The Euro-Inf Project aims at the creation of a framework for setting up a European system for accreditation of informatics education at the First Cycle and Second Cycle level (as defined within the Bologna process), with the following main aims: improving the quality of educational programmes in informatics, providing an appropriate ‘European label’ for accredited educational programmes in informatics, facilitating mutual transnational recognition by programme validation and certification, facilitating recognition by the competent authorities, in accordance with the EU directives and other agreements, and increasing mobility of graduates as recommended by the Lisbon Strategy”*.<sup>36</sup>

This initiative, a pan-European framework for accreditation of university ICT programmes, in partnership with industry and as a complementary part of an industry-aligned “European e-Competence Framework”, should be recognized, supported, and promoted.

**Public Policy Key Recommendations to Foster Innovative Solutions and Capacity Building through Multi-stakeholder Partnerships and Enhanced Business-university Cooperation:**

- **Enhance the innovative capacity of Europe by supporting technology neutrality in ‘lead market’ initiatives and public procurement for government software infrastructures**
- **Maintain a careful multi-stakeholder balance driven by associative partnerships (industry, governments and third parties) alongside public support for industry-based ICT skills standards and certification**
- **Increase the number and visibility of ICT-related ERASMUS MUNDUS masters and placements to attract more students from Central and Eastern European countries and other new EU Member States**
- **Improve the image of the ICT and software industries, especially targeting the youth and women, through a continuous European awareness campaign on high-tech basic ICT education capabilities and professional ICT careers opportunities in Europe**
- **Promote the creation of a European framework for the accreditation of ICT educational programmes at university levels within the Bologna Process in association with industry**
- **Strengthen the development of new university 2.0 models to adapt to the social computing phenomena and the networked information economy, and to establish ICT business-university associative partnerships.**

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<sup>36</sup> Euro-Inf Project – ‘European Accreditation of Informatics Programmes’, [www.euro-inf.eu/](http://www.euro-inf.eu/) (for the US accreditation system see: ABET, formerly the ‘Accreditation Board for Engineering and Technology’, [www.abet.org](http://www.abet.org))

## **Conclusions**

The European software industry is a growing and economically significant sector that has proven itself competitive both within the EU and internationally. Many other companies involved in hardware, distribution, training, education, and services also depend on this software sector for their livelihoods and for the success of their own products and services. The existing policy and legal framework has largely worked in contributing to the success of the software sector in Europe.

The European software industry is at a cross-road, however. Issues of global competition, a shortage of qualified labour, and a rapidly changing technological landscape are converging to test the potential of Europe's software industry.

The Working Group believes European industry can continue to thrive and compete, both within the EU and globally, without a managed approach to technology. Rather, the Group believes what is necessary is to provide Europe's industries with the critical tools of innovation. The way forward is first and primarily to focus on the intellectual assets and human capacity building in this knowledge based industry - people. Fundamentally, the ICT-embedded economy is built on the innovative and creative capacity of its individuals. The Group believes Europe already has the talent and creativity to compete and lead globally. Without the incentive to develop innovative talent, the industry falters.

It is here that the Group believes the Commission needs to focus energy. In all, we encourage the Commission to continue its work to support the innovative capacity of Europe's talent. ***E-Skills and human capacity building*** must remain a cross-sectoral and critical area of focus for the European Software Strategy as a whole.

## **Attachments:**

- Key Recommendations
- List of Group Members

### **Key Recommendations:**

- **Foster e-Inclusion, general e-skills and lifelong ICT learning** among the labour force through multi-stakeholder partnerships with industry and other stakeholders concerned;
- **Ensure ‘access to access’** throughout the entire ‘Training-Employment Value Chain’, including *access* to technology and physical infrastructure in schools, *access* to training and content, curricula and certifications, *access* to public funding, and finally *access* to labour placements;
- **Recognize ICT skills value credentials** and support industry-based ICT skills certifications to keep European software industries competitive;
- **Consider EU-funded scholarships** for underprivileged individuals to supplement basic ICT educational learning in key ICT areas;
- **Consider EU-funded university scholarships** for ICT skills and software engineering degrees in cooperation between industry and universities;
- **Provide financial or other support measures** for notably individuals to invest in e-skills training and qualifications;
- **Adopt tax breaks or financial incentives for companies**, in particular SMEs, that conduct ICT training, R&D and other software related innovation and human capacity investment;
- **Establish a “European Software Expertise Network”** to enhance ICT skills capacities in software development and engineering, in management and to go-to-market capabilities;
- **Enhance the innovative capacity** of Europe by supporting technology neutrality in ‘lead market’ initiatives and public procurement for government software infrastructures;
- **Maintain a careful multi-stakeholder balance** driven by associative partnerships (industry, governments and third parties) alongside public support for industry-based ICT skills standards and certifications;
- **Improve the image of the ICT and software industries**, especially targeting the youth and women, through a continuous European awareness campaign on high-tech basic ICT education capabilities and professional ICT careers opportunities in Europe;
- **Promote the creation of a European framework for the accreditation** of ICT educational programmes at university levels within the Bologna Process in association with industry;
- **Strengthen the development of new university 2.0 models** to adapt to the social computing phenomena and the networked information economy, and to establish ICT business-university associative partnerships.

*For the implementation of the above recommendations the Working Group proposes to establish within the new European Commission one central high-level and cross services unit in charge of all matters related to ICT skills and workforce developments*

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