

E-Skills, Competitiveness and Employability

Knowledge Societies' Next Frontier

The beginning of a new century has been accompanied by a number of a broad revisiting of what our societies could consider as bases for sustained and more equitable growth. Worldwide, this has led to placing knowledge and information at the centre of national and regional ambitions.

In Europe in particular, the so-called Lisbon Strategy has enhanced efforts to mobilize active economic and social forces around education, innovation and knowledge intensive sectors and activities such as information and communications technologies. At the same time, European institutions and national governments have pursued their efforts to deepen and strengthen a European social model whereby inequalities and exclusions are being addressed largely through higher levels of employability.

E-skills are the cornerstone of such an approach. Is Europe succeeding in generating or acquiring the skills it needs to build a leading and inclusive knowledge society ? What is needed from governments, business and citizens to achieve this goal ?

This White paper is accompanied by a dedicated website

<http://www.insead.edu/elab/eskills>

This site provides a certain number of tools to compare individual country performances, as well as to identify their relative strengths and weaknesses across the various dimensions of e-skills readiness and related data.

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Knowledge Societies' Next Frontier

We need to develop skills today that we need tomorrow. There is some urgency. Already today, millions of vacancies in Europe are unfilled because there are not enough people with the right skills to fill them. For example, in one of Europe's key industries, advanced network technology – which includes mobile telecommunications, one in six vacancies cannot be filled. Only three years ago, this was one in twelve vacancies. This is a fast-growing sector for employment, and we cannot let this situation get worse.

Jose-Manuel Barroso, President of the European Commission¹

Whether or not e-skills⁽²⁾ are available in sufficient numbers and quality will determine how countries succeed or fail as knowledge societies. Europe, having embarked on the ambitious and visionary process of advancing its “Lisbon Strategy”, has special stakes, challenges and opportunities in addressing the issue of e-skills as a matter of priority.

Generating the right volume and level of e-skills is a complex endeavor, which needs to combine at least five major components, namely:

- Assessing current and future needs for e-skills
- Evaluating current and future possibilities to generate, develop or import such skills
- Identifying resulting shortages, gaps, and mismatches
- Selecting appropriate policies and actions to correct any imbalance, and
- Provide the leadership, resources and processes by which such action will be undertaken.

The present paper focused on the first three of those components, while attempting to provide some benchmarking tools by which member countries may be able to assess their current and future challenges regarding e-skills.

Whether or not e-skills are available in sufficient numbers and quality will determine how countries succeed or fail as knowledge societies

¹ *Lisbon: a Strategy for All Seasons*, speech delivered at the Lisbon Council Growth and Jobs Summit - Brussels, 4 March 2008

⁽²⁾ Defined loosely here as ‘the skills required in a knowledge economy’. A more detailed working definition is used later in this report (see box 1)

Skills for the knowledge economy : what are we talking about ?

E-skills are only a subset of the broader range of talents and skills that governments and business need to compete and succeed in the global knowledge economy. Such skills include the ability to manage across national and cultural borders, to stimulate and grow innovation across network-based teams, and to engage consumers and producers in sharing knowledge and information through shared platforms, for example. In the emerging global market for talents, such high-level skills will be in increasing demand.

On the other hand, e-skills are broader than ICT skills, and encompass – in addition to those needed to produce or sell software and ICT systems - the ‘user skills’ which are indispensable to ensure that non-ICT sectors, as well as society as a whole, draws the full benefits from advances in the ICT sector, especially through productivity gains and better social integration. For the purpose of this paper, the definition adopted at the European e-Skills Forum of 2004 (see box 1) will be used.

Box 1 – Defining e-skills

The European e-Skills Forum (2004) discussion on e-skills has resulted in definitions for three *different* types of skill.

- **ICT user skills:** the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work, which is, in most cases, not ICT. User skills cover the utilisation of common generic software tools and the use of specialised tools supporting business functions within industries other than the ICT industry.
- **ICT practitioner skills:** the capabilities required for researching, developing and designing, managing, the producing, consulting, marketing and selling, the integrating, installing and administrating, the maintaining, supporting and service of ICT systems.
- **e-Business skills:** the capabilities needed to exploit opportunities provided by ICT, notably the Internet, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, and to establish new businesses.

It has often been pointed out that defining e-skills is an impossible task because it requires (1) a precise and stable description of relevant skills, to allow the building of time series and comparability across countries, and (2) a flexible approach to such a description, to make it resilient to future changes in technologies and processes, which are bound to modify the skills required to use and implement them. The following analysis tries to factor in this central difficulty by suggesting a dynamic approach e-skills issues, in particular from the demand side. From a supply point of view, the methodology of the Networked-Readiness Index (NRI) developed by the World Economic Forum and INSEAD (www.insead.edu/elab/gitr) has been used to assess how ‘e-skills-ready’ Europe currently is.

Is Europe 'e-Skills-ready' ?

Over the last decade, Europe as a whole has fared remarkably well in terms of its readiness to benefit from the emerging global knowledge economy. The NRI series produced annually by INSEAD and the World Economic Forum since 2000 show that Nordic countries, in particular, have remained at the top of network readiness during the whole period covered by the index (see Table 1 below).

It is not enough to be network-ready to be e-skills-ready

NRI Rank	2001-02	2002-03	2003-04	2005-05	2005-06	2006-07
1	Finland	USA	Singapore	USA	Denmark	Denmark
2	US	Singapore	Iceland	Singapore	Sweden	Sweden
3	Singapore	Finland	Finland	Denmark	Singapore	Switzerland
4	Sweden	Sweden	Denmark	Iceland	Finland	USA
5	Iceland	Denmark	USA	Finland	Switzerland	Singapore
6	Canada	Canada	Sweden	Canada	Netherlands	Finland
7	U.K.	Switzerland	Hong Kong	Taiwan	USA	Netherlands
8	Denmark	Norway	Japan	Sweden	Iceland	Iceland
9	Taiwan	Australia	Switzerland	Switzerland	U.K.	Korea
10	Germany	Iceland	Canada	U.K.	Norway	Norway

Table 1 : Network Readiness champions (2001-2007)

However, recent studies³ have pointed out that, even among Scandinavian economies, some 'knowledge cracks' had started to appear and that many of them had to do with human resources and skills management.

In most European countries, similar tensions are being felt by enterprises. Growing inadequacies between the need for more e-skills on one hand, and Europe's ability to generate or acquire them at the required pace on the other, were initially underlined by the ICT sector. They are now becoming a source of concern for many other sectors.

An initial attempt to transpose the NRI methodology to the e-skills context (see Appendix) allows to identify a few areas where Europe may be facing growing challenges in the coming years. Although this approach still lacks the level of granularity necessary to rely on a definition of e-skills as precise as the one described earlier (Box 1), it points to a few interesting avenues, worthy of further analytical and policy consideration.

Even among Scandinavian economies, some 'knowledge cracks' have started to appear

³ For example "E-readiness in Nordic Countries - How long will the stars keep shining ?" a Cisco research paper, December 2007. <http://www.networkedreadiness.com/nordic>

A contrasted landscape

Based on a simplified model of determinants of e-skills supply, and using existing hard and soft data on quality and level of education, availability of scientists and engineers, linkages between industry and universities, etc., some preliminary research has allowed to rank a significant number of countries in terms of 'e-skills readiness'⁴.

In terms of e-skills readiness, Europe projects a rather disjointed image

As expected, available data confirm a high degree of correlation between e-readiness (as measured by the NRI) and e-skills readiness (as described by the eSRI). Moreover, a typology of countries emerges from the NRI/eSRI comparison, whereby three sub-groups can be identified (Figure 1).

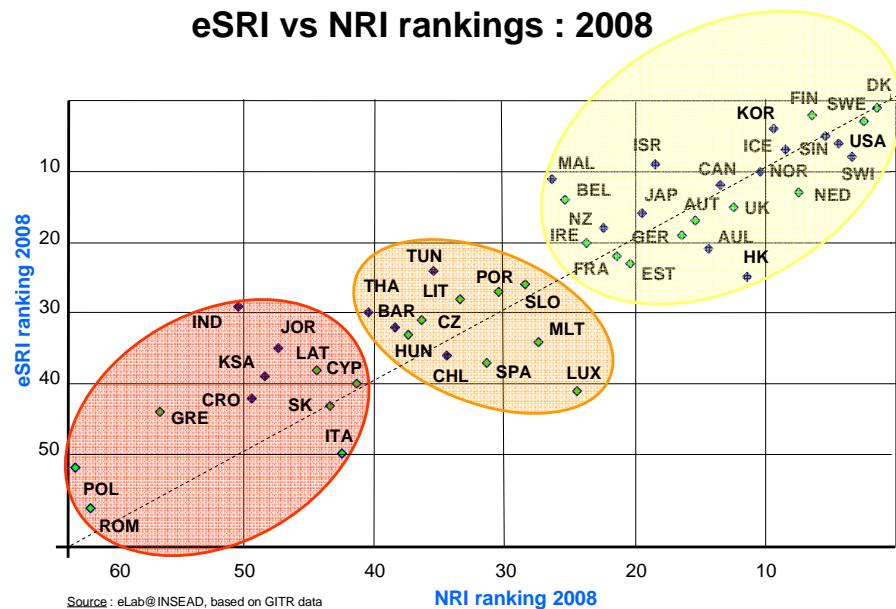


Figure 1: network-readiness vs e-skills readiness

The first one displays both high e-readiness and relatively high e-skills readiness; it includes Europe's northern countries (Denmark, Sweden, Finland), as well as the Netherlands, Belgium, the United Kingdom, Austria, Germany, Ireland, France and Estonia. Concerns about reaching adequate levels of e-skills should be more acute in the second group (which includes Slovenia, Portugal, Lithuania, the Czech Republic, Hungary, Malta, Spain and Luxemburg. In other members of the Union (Cyprus, Latvia, Slovakia but also larger economies like Greece, Italy, Poland or Romania), local readiness to generate e-skills may be regarded as insufficient.

⁴ Details of the model and methodology used to build the e-skills readiness index (eSRI) can be found at www.insead.edu/elab/eskills

Transforming Europe into an inclusive and competitive knowledge society

Faced with this diverse situation, European governments need to recognize that they are nevertheless facing a common challenge. In today's global economy, the mobility of production factors is continuously increased by technological advances and new business and organizational models. Human resources, whether in 'commoditized' (i.e. low-skilled) occupations, or in highly sought job niches cross borders more easily and more eagerly than ever before. In such a context, wage differentials, but also regulatory, fiscal and immigration boundaries may have a greater impact on the local supply of e-skills than natural and geographical ones. Long-term trends – e.g. in demography or in education - will limit the ability of governments to obtain rapid results in bringing supply and demand for e-skills closer to each other at the local level, adding to the relevance of proper immigration and mobility policies, but also to concerted action in life-long learning, distance learning and vocational training.

Figure 2 attempts to describe in a simplified way the interplay between some of these determinants of e-skills supply and demand. The size of the yellow area (which includes a combination of e-skills shortages, e-skills gaps, and e-skills mismatches) will have a direct impact on the competitiveness of Europe's knowledge economy.

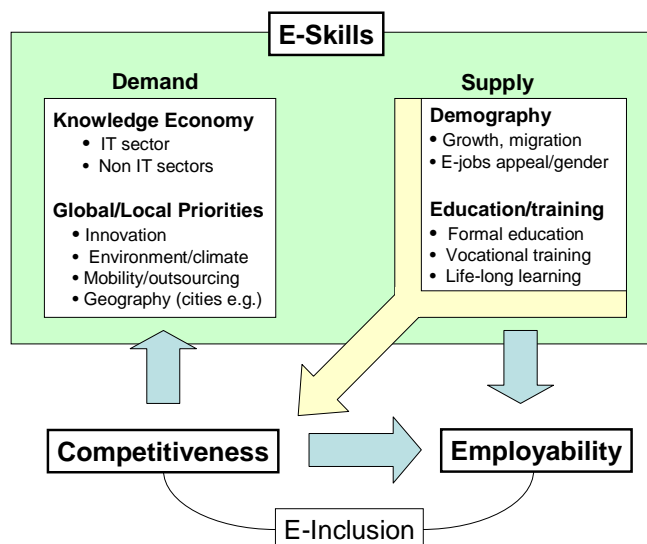


Figure 2 : Main elements of the e-skills equation

On the other hand, the social dimension of e-skills cannot be overemphasized, both on the supply side (e.g. how the younger generation is attracted – or not - to math, science and ICT jobs, and whether this attraction is gender biased or not) and on the demand side (an inclusive knowledge society will require better access to e-skills for European populations as a whole). Specific tools and instruments will need to be designed and implemented to address those dimensions locally at Union level, to create the required positive synergy between the joint pursuit of competitiveness and employability.

E-skills in Europe 2025

The demand side

To determine whether the ‘e-skills crunch’ felt or feared by many in Europe is of a cyclical or structural nature requires to consider the main elements likely to influence the demand for e-skills from European-based enterprises and organizations .

Some of those elements can be quantified: they include for example the projected growth rate of the European economy, or the ICT-intensity of European production processes. Those factors will largely determine the ‘quantitative demand for e-skills’ in the medium and long term.

Demand for e-skills results from a combination of factors, some of which resist quantification

Analyzing, anticipating and measuring e-skills demand

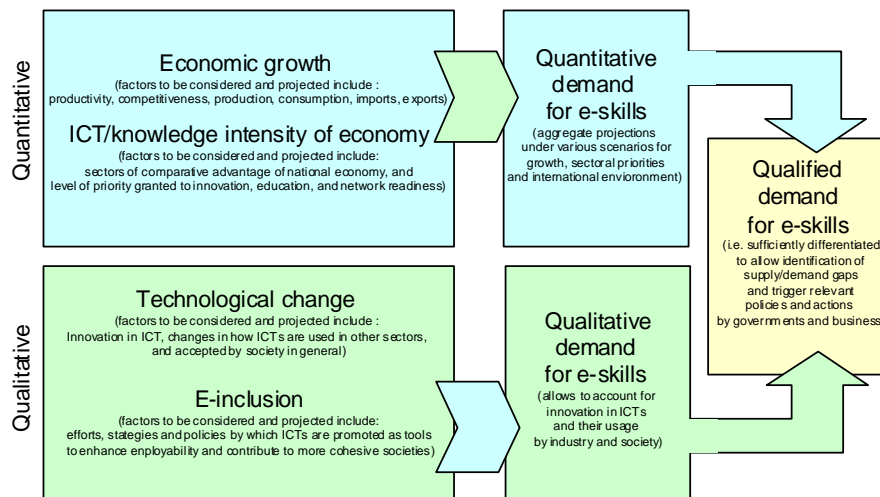


Figure 3 : Medium-long term factors of demand for e-skills

Other elements, however, will have a more qualitative flavor and impact on the nature (rather than the volume) of e-skills required. They include for example the impact of technological innovation and the extent of e- inclusion, seen in particular from the angle of social acceptance of new technologies.

The combination of those two sets of elements (schematized in Figure 3) will determine the ‘qualified demand for e-skills’ which should be the point of reference of the strategies and actions aiming at influencing how demand and supply of e-skills can meet.

E-skills in Europe 2025

The supply side

As mentioned earlier, the increased international mobility of skills is increasing the impact and relevance of regulatory, fiscal and immigration measures vis-à-vis the local supply of e-skills. Notwithstanding the relative importance or resulting international flows of e-skills, local supply remains mainly influenced by two major components, namely demography and education.

European demographics

In the medium-long run, the demographic situation of Europe offers a striking and remarkably differentiated picture (Figure 4): with the exception of Austria, all member countries East and South of a virtual line Nice-Kiel-Helsinki will face a net (and sometimes dramatic) population loss, whether the rest of EU25 will witness a net increase. Yet, much of this increase (as in the case of the UK) will come from migration flows.

In Europe, demography, education, migration and regulation combine into a complex mosaic. Regarding e-skills however, some patterns seem to emerge

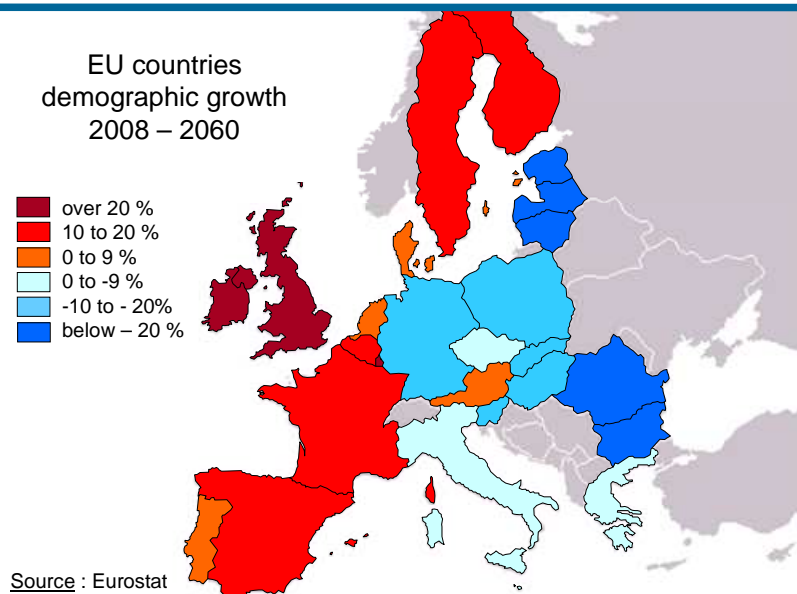


Figure 4 : European population in fifty years

More than aggregate numbers, however, demographic trends are particularly relevant to e-skills generation in terms of age distribution. A growing population is likely to have a lower age average, and hence a greater ability to generate higher numbers of e-skilled citizens.

European education

As far as formal education is concerned, Europe remains well placed in international rankings (such as OECD's PISA). However, the quality of math and science education is less than in Singapore: among EU25 members, Belgium and France lead, while Italy, Spain and Portugal trail (Figure 5).

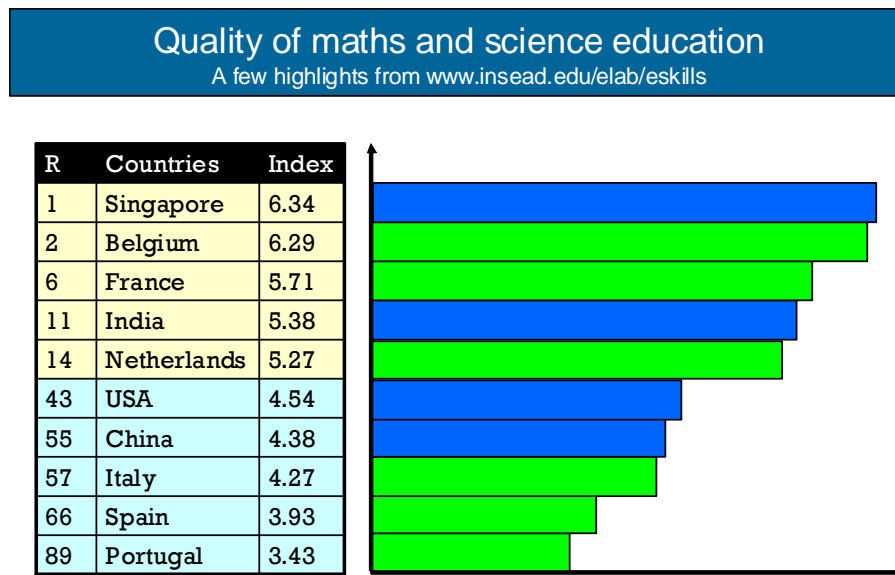


Figure 5 : Quality in math and science education

Even more than differences in quality, the diminished appetite of younger generations for math and science is of direct relevance to Europe's potential to produce higher volumes of e-skilled workers at all levels. Local studies show that gender stereotypes continue to play a negative role in that context.

Vocational training, on-the-job learning, combined with on-line training and education are seen as powerful tools to compensate for those limitations of the formal education sector. However, their full development will require European-wide approaches in areas such as qualifications, e-competence curricula, or certifications. Building on past successes (CDL e.g.), such approaches would benefit from stronger partnerships between industry and governments.

Diminished interest in maths and science continues to plague Europe's education systems

The geo-dynamics of scientists/engineers availability

In several European countries (including Germany) concerns have recently been expressed about the negative effect of insufficient availability of scientists and engineers. In this regard (Figure 6), smaller economies (such as Estonia, Luxemburg, Slovenia, Latvia) are more directly exposed, but larger ones (including Spain, Romania, Italy or Poland) are not immune either. From the point of view of e-skills, available data show a high correlation with the rankings of Figure 6. The same issues are hence worth raising in terms of ‘net foreign supply’.

Talent may be the first core resource to be sourced globally. Is Europe ready for this ?

Availability of scientists and engineers
A few highlights from www.insead.edu/elab/eskills

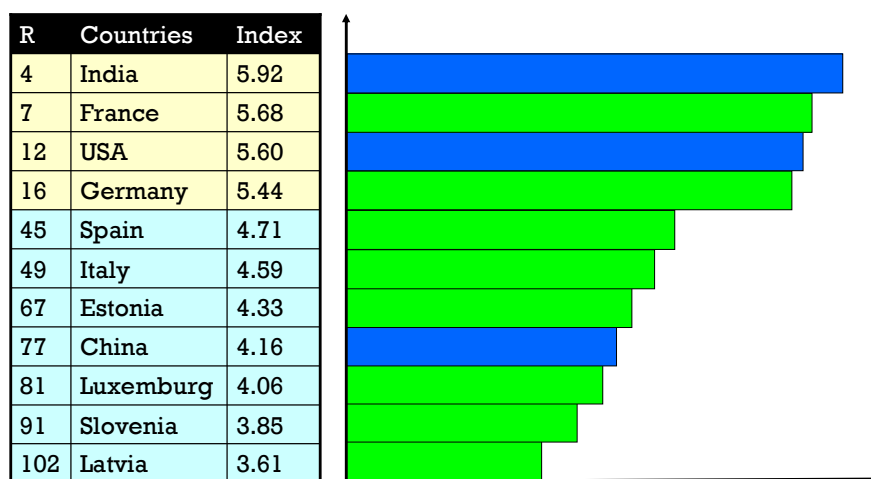


Figure 6 : Availability of scientists and engineers

Neither India nor China will produce enough engineers, scientist and e-skilled graduates to satisfy the needs of their fast growing economies. Faced with restrictive visa policies in the United States (traditionally the biggest market for education), a whole population of high-potential young citizens from developing countries has become less likely to emigrate, and to start innovative ventures in Silicon Valley or similar hubs of university-business collaboration. While this might be good news for some universities in Europe, it results in a net reduction of e-skilled workers available to compensate for current scarcities in a number of sectors.

Europe-based companies should not count on Indian NTI graduates to save the day

The importance of sharing a compelling vision

Both at national and European levels, governmental institutions have a crucial role to play in articulating and communicating a future-looking and action-oriented vision of how a knowledge society can serve both the objective of a competitive Europe and that of an inclusive European social model.

art of this ‘knowledge vision’ must include an engaging ‘ICT vision’: political leaders have a responsibility to convince their citizens that ICT is a positive and central contributor to realizing this vision. In this respect, several EU members are well placed (Figure 7), such as Portugal, Malta, Denmark, Estonia, Finland or Austria. All other members rank after India and China.

Inclusion and competitiveness can be the twin backbones of a shared European approach to the e-skills challenge

Importance of ICT to government’s vision of the future
 A few highlights from www.insead.edu/elab/eskills

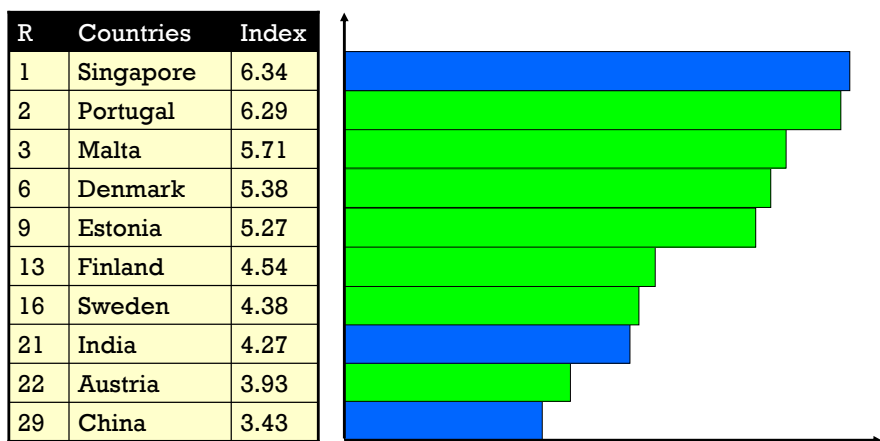


Figure 7 : ICT as part of governments’ vision of the future

However, to trigger successful action, such a vision must be shared by all relevant stakeholders. Multi-stakeholder partnerships are a key ingredient to allow such sharing⁵.

⁵ Here again, Europe can ambition to build on successful examples, such as the e-skills Industry Leadership Board (Box 2)

Box 2 – Strengthening public-private e-Skills partnerships

The e-Skills Industry Leadership Board (e-Skills ILB) was founded on June 7, 2007, by a group of prominent players in the ICT and knowledge field, including Cisco, Hewlett-Packard, Oracle, Microsoft, and Siemens. The e-Skills ILB defines its mission as “to lead the ICT sector’s contribution to the development and implementation of a long term e-skills and digital literacy agenda in Europe.” It was then formally welcomed and endorsed by the Vice President of the European Commission and Commissioner for Enterprise and Industry, Commissioner Gunter Verheugen, as well as in the European Commission Communication on e-skills of September 2007.

The e-Skills ILB is committed to leading the ICT sector’s contribution for the development and implementation of a long-term e-skills and digital literacy agenda in Europe, focusing on areas such as : (1) motivating and empowering future generations with e-skills, (2) promoting ICT practitioner learning, education, competences, and training, (3) boosting the employability and productivity of the workforce with ICT user skills, including the deployment of multi-stakeholder partnerships (MSPs), and (4) providing foresight and support for future skills needed in a changing environment with emerging technologies and new business models.

The e-Skills ILB welcomes additional members from among ICT industry stakeholders that share the same objectives and are able to contribute resources and expertise in support of European e-skills policies.

The more visibility such partnerships will receive, and the more inclusive they will prove to be, the stronger their contribution to identifying the various dimensions of the e-skills debate and to implementing the right action plans.

Conclusions & proposals for action

In today’s global economy, Europe incarnates a rather unique combination of economic might on one hand, and of soul searching on the other, whereby competitiveness and social cohesion are being pursued jointly.

Building a competitive and inclusive knowledge society hence calls on the core values of the European edifice. Generating the corresponding human resources will test the solidity and resilience of its underlying principles. In many respects, the e-skills challenge – and how it will be addressed – will hold symbolic significance for many other dimensions of Europe’s future.

Five key actions to enhance ‘e-skills readiness’

Specific actions are required at industry and sector levels, in order to reduce e-skills mismatches for example. Many have been proposed already and await action.

In the area of e-skills, however, one must keep in mind that (1) technological innovation will largely dictate the skills that European societies will need in the future to make the best of ICTs, and (2) social acceptance and usage of new technologies generally defy predictions⁶. Hence, to elevate its level of ‘e-skills readiness’, Europe will need to maintain an approach that should be consistent in its goals (employability, competitiveness) while remaining flexible in its specifics (technical definitions of e-skills for example).

This will require, for example, that ICT practitioner should benefit from career-long training opportunities to guarantee the continuous relevance of their skills. Equally important will be the training/sensitization to be provided to business managers to help them understand the potential and relevance of ICT, and make appropriate decisions⁷.

A unique opportunity for Europe to re-build its leadership while strengthening its social model

Key actions	Expected leader
1. Share a compelling ‘e-vision’	governments (based on inputs by MSPs) : fiscal, migration, education
2. Strengthen e-skills MSPs	governments (visibility) industry (inclusion and action)
3. Formulate EU-wide e-curricula	Industry (needs), academia (formulation), governments (regulatory)
4. Promote math and science	academia (curricula), government (vision), industry (sponsoring)
5. Enhance life-long learning	industry (content, rewards), government (fiscal), academia (e-learning)

The five key actions outlined above are broad enough to fit this dual agenda, yet precise enough to touch upon some of the key factors likely to affect Europe’s e-skills situation in the medium and longer term. If they receive sufficient support from the various stakeholders mentioned, they can generate the wide engagement that the current stakes call for, and contribute not only to alleviate Europe’s e-skills burden, but make such skills a cornerstone of employability and competitiveness in the future.

Most importantly, whichever actions or initiatives are taken to address Europe’s e-skills challenges, they need to have a strong strategic (long term) underpinning. This requires in particular that such action should be both scalable and sustainable. Many well intentioned initiatives have been too dispersed and small-scale to generate the change of pace which is now required.

⁶ As the emergence and growing importance of social and networks has amply shown in the recent past.

⁷ The issue of ‘business-ICT’ alignment is of increasing interest for industry worldwide. See for example the recent study undertaken by INSEAD’s eLab for IBM on “New roles of the CIO”, at www.insead.edu/elab

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