

Developing e-Skills for Competitiveness, Growth and Employment in 21st Century: The European Perspective¹

Dr. Sumanjeet

Assistant Professor
Department of Commerce
Ramjas College
University of Delhi
Delhi-7, INDIA

E-Mail: sumanjeetsingh@gmail.com

Voice: +91-92-153-26-126

¹ An earlier version of this paper was presented in Ninth International Conference in Commemoration of Prof. Marco Biagi "Europe 2020: comparative perspectives and transnational action. From recession to recovery in labour markets, industrial relations and human resources management" held in Modena (ITALY) from 17-19 March 2011.

The DEPOCEN WORKING PAPER SERIES disseminates research findings and promotes scholar exchanges in all branches of economic studies, with a special emphasis on Vietnam. The views and interpretations expressed in the paper are those of the author(s) and do not necessarily represent the views and policies of the DEPOCEN or its Management Board. The DEPOCEN does not guarantee the accuracy of findings, interpretations, and data associated with the paper, and accepts no responsibility whatsoever for any consequences of their use. The author(s) remains the copyright owner.

DEPOCEN WORKING PAPERS are available online at <http://www.depocenwp.org>

DEVELOPING E-SKILLS FOR COMPETITIVENESS, GROWTH AND EMPLOYMENT IN 21ST CENTURY: THE EUROPEAN PERSPECTIVE¹

Dr. Sumanjeet

Assistant Professor

Department of Commerce

Ramjas College

University of Delhi

Delhi-7, INDIA

E-Mail: sumanjeetsingh@gmail.com

Voice: +91-92-153-26-126

Abstract: Modern economies are driven by skilled people, who create and use the technology. e-Skills has been considered as a prerequisite for employment in every sectors. Though the Europe is home to world class technology companies and IT savvy people, existing studies revealed that there is a widespread recognition in the EU of an expanding gap between demand and supply of e-Skills. Far from being an ICT sector issue, Europe's growing e-skills shortage is affecting productivity and the competitiveness of all types of organizations. Further, due to lack of e-skills, millions of European citizens are not able to access ICTs. Their inability to access ICTs deprives them to reap the benefits of ICTs. Added to these, facing competition from the US and Japan but also increasingly from India and China, Europe needs more highly e-skilled professionals of its own. Europe's education and training systems have not kept up with the exploding demand for e-skills. This has initiated, at different levels, a policy debate about how to better promote e-skills in Europe, in order to fully reap the potential benefits of ICTs. In this light, the present paper explore some key issues related to development of e-Skills, while attempting to provide some benchmarking tools by which European countries may be able to access their current and future challenges regarding e-skills.

Key Words: Europe 2020, ICTs, e-Skills, Competitiveness, Job Creation

JEL Codes: O33; J24; D21

1. INTRODUCTION

The beginning of the 21st 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 and Communication Technology (ICT) at the center of national and regional ambitions (INSEAD, 2008; Liebenau, 2007; Stigliz, 1998). A wide range of evidence demonstrates beyond doubts that the ICTs have already become the primary 'up-stream' transformational power driving productivity growth (Corrado *et al*, 2005; Inklaar *et. al*, 2005; Tripleet and Bosworth, 2008), innovation and job creation in every market ((Hollenstein, 2002; Jorgenson, 2001; McGuckin and Van, 2001; Greenan *et al*, 2001; Hampell, 2002). Productivity growth and innovation shepherd competitiveness in the market which is an essential condition for economic growth

¹ An earlier version of this paper was presented in Ninth International Conference in Commemoration of Prof. Marco Biagi "Europe 2020: comparative perspectives and transnational action. From recession to recovery in labour markets, industrial relations and human resources management" held in Modena (ITALY) from 17-19 March 2011.

and job creation in the 21st century. As a result, an increasing number of nations are competing to establish themselves as world's leading information societies (Nelson and Winter, 1982; Neuman, 1991; Mody and Dahlman, 1992; Negroponte, 1995). In Europe, both Lisbon Strategy 2000² and its follow up agenda Europe 2020³, highlights ICTs as a crucial factor of socio-economic growth and job creation. The Digital Agenda of Europe 2020 focuses on ICTs capability to reduce energy consumption, reduce carbon emissions, support ageing citizens' lives, revolutionizes health services and deliver better public services. Further, it is expected that ICTs will increasingly drive productivity, sustainable growth, innovation and employment throughout the European economy in a myriad of ways. The question is whether Europe will be able to realize this potential.

The European Commission envisions an innovative, inclusive and dynamic Europe based on a knowledge-based economy and society. European businesses need to be placed at the forefront of innovation to enhance Europe's business competitiveness; to enhance the employability and professional prospects of students, workers and the unemployed; and to support the social integration of those at the margins of civil society. There has never been a more compelling or opportune time in Europe's economic, industrial and societal development to focus on the essential training and development necessary for Europe to lead the world in innovation and developing the industries of tomorrow. Accelerating the uptake of e-skills is the first important step. It is now widely recognized that knowledge and ICT based strategies have to grant stronger priority to the generation of e-skills⁴ (ICT practitioner skills⁵, ICT user skills⁶ and e-business skills⁷). The new EU Commission, for example, continues with its long-term e-skills strategy to boost the productivity and the employability of its workforce, enabling a response to global competitive challenges

² The Lisbon Strategy was launched in 2000 at the European Council in Lisbon. The goal of the Strategy is to make the European Union "the most dynamic and competitive knowledge-based economy in the world." This economic and social strategy is based on three pillars: (1) Preparing the transition to a competitive, knowledge-based economy and society; (2) Modernizing the European social model, investing in people and combating social and exclusion (3) Applying an appropriate macro-economic policy mix. A fourth, environmental pillar was added to the Strategy at the Göteborg European Council meeting in 2001.

³ Europe 2020 is the EU's growth strategy for the coming decade. In a changing world, we want the EU to become a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion. Concretely, the Union has set five ambitious objectives - on employment, innovation, education, social inclusion and climate/energy - to be reached by 2020. Each Member State will adopt its own national targets in each of these areas. Concrete actions at EU and national levels will underpin the strategy.

⁴ The European e-Skills Forum adopted in 2004 a definition of the term "e-skills" covering three main categories: ICT practitioner skills; ICT user skills and e-business skills. This definition was retained by the European Commission in its Communication on "*e-Skills for the 21st Century*".

⁵ ICT practitioner skills: these are the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems.

⁶ ICT user skills: these represent the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialized tools supporting business functions within industry. At the general level, they cover digital literacy: the skills required for the confident and critical use of ICT for work, leisure, learning and communication.

⁷ E-business skills (also called e-leadership skills): these correspond to the capabilities needed to exploit opportunities provided by ICT, notably the Internet; to ensure more efficient and effective performance of different types of organizations; to explore possibilities for new ways of conducting business/administrative and organizational processes; and/or to establish new businesses.

2. RATIONALE OF DEVELOPING E-SKILLS IN EUROPE

The importance of e-skills competency to Europe's economy and society is increasingly and broadly recognized. Several reasons have contributed to the relatively high demand of e-Skills in Europe in the last decade. First, ICT has become all pervasive in personal and social life of European people. The success of e-skills added to the fact that it is important for developing new hardware and software and business activities lies in the fact that in today's world a large package of information goes through Internet. It is though very important to be able to access it as a means of communication. In order to be able to communicate through the new electronic systems people need to have the necessary skills to search for and identify information as well as evaluate it. e-Skills benefit the individual in many ways: they save time; reduce the efforts involved in planning, staying informed, and keeping in touch; provide access to better information through the online availability of multiple and mutually independent information sources; enhance private life through easier communication with family and friends in word, picture, and sound; save money through price comparison websites; and give access to opportunities that are solely available through the Internet, such as special low-cost airline tickets and employment service CV databases whose use is mandatory for all registered job-seekers (Tuomi, 2005; UNESCO, 1996; Sumanjeet, 2009; Hampton and Wellman, 2000; Dertouzos, 1997). There is also evidence which shown that when adults have a basic foundation of e-Skills and the confidence to learn online they are more likely to stay engaged in learning and more likely to progress.

“Increasing access to broadband, open resources and digital services means there are more opportunities and media to support learning than ever before. Technology enabled learning brings a sense of empowerment and wider choice to informal learning⁸”.

There are also significant benefits of e-Skills for elderly population in Europe⁹. E-Skills can help these people to continue their live independently in their own homes, through the use of equipment that makes it possible for them to call for help and assistance when they need it. Further, who are housebound or are unable to travel, e-Skills provides them much needed social interaction and the chance to establish new friendship and support network (Sergio and Josep, 2009¹⁰; Thornton and Corden, 2002; Meager and Hill, 2005).

Second, ICT career has become more attractive and offer huge employment opportunities both directly and indirectly. There is a growing acceptance among academics, policy-makers, and employer groups that e-Skills are becoming an important entry ticket to the job market- and crucial for people that want to move into better jobs. Nearly all industries, including medical, financial, industrial, and social support enterprises increasingly require employees to have basic IT skills for a wide range of jobs. This is relevant across both blue-and white-collar positions. The development of e-Skills improves the capacity of people to absorb technology when, they move to the workforce (OECD, 1999; Kozma, 2005). Many studies

⁸ Harnessing Technology: Transforming Learning and Children's Services, DfES, March 2005.

⁹ Today, 19 of the world's 20 “oldest” countries-those with the largest percentage of elderly people (65 or older)-are in Europe. In Italy, the world's oldest country by these standards, over 19 percent of the population is elderly. This figure is expected to reach 28 percent by 2030.

¹⁰ The results reveal that usability is related to independency. When ICT are easy to use, older people are independent users. Independency (dependency) can be identified by the number and type of questions, environmental noise disturbing interactions and required practice to master ICT. Independency leads to experiences that are emotionally fulfilling, supportive of exploration and reassuring. Dependency results in very sad experiences. These results suggest another way of seeing the interactions of older people with ICT, far from traditional individual age-related changes in functional abilities.

emphasized that jobs and their requirements are changing (Ambrosini *et al.*, 2006). Collaboration, critical thinking, problem-solving, creativity and entrepreneurship are becoming increasingly important and ICT can provide support by enabling new opportunities for knowledge and value creation. E-Skills are becoming a key component of the new skills requirements for new jobs (OECD, 2008; Sengupta, 2006). e-Skills are also needed to access job listings on the Internet. Without these basic skills, job searchers will find their ability to find appropriate jobs severely limited. Some employers advertise jobs solely online, and recruitment processes are increasingly electronic. A recent study of UK Online¹¹ focused on the differences between users and non-users of the Internet in social class C2DE, and suggested a strong relationship between an individual's ability to use technology and their confidence in finding employment. Adults who were able to use ICT were 25 per cent more confident about finding a job than non-users. Further, lack of basic e-Skills can be a significant barrier to employment for immigrant women, among others. Research survey data revealed that immigrant women clearly identify access to IT as critical to improving their social and economic status in the EU. There is a strong correlation between ICT skills level and current employment status: immigrant women with no or basic e-Skills show higher levels of unemployment (Laffarge, 2010). The study found that after the home, community-based NGOs are the second most important place where immigrant women acquire e-Skills and also where they access and use ICT. NGOs were also found to be an important network to access jobs (IDC Economic Impact Study 2009 Technology & Social Change).

Third, there is strong consensus that a long term e-Skills strategy is more important than ever in the context of crisis¹². A European agenda for economic recovery also admit the important role of e-Skills (Marianne *et al.*, 2009¹³). The Europe 2020 plan unveiled by EC President Jose Manuel Barroso on 3rd March 2010 sets out a blueprint for Europe's recovery and a sustainable social market economy that is competitive, innovative, and inclusive information and communication technologies like mobile phones and Internet are essential part of this. History has shown that in times of economic downturn, old businesses and old business models become unsustainable and cease to exist, while new ones emerge. Never has this creative destruction been more relevant than in the ICT age. Furthermore, when resources are scarce, they need to be focused on the areas where their impact will be greatest. Studies revealed that e-Skills contribute considerably to innovation and improved productivity and efficiency. When the economic situation improves, the organizations that will benefit the most will be those that can react quickly to the changing circumstances, demonstrating agility by providing new products or services or responding rapidly to increased demand. Economies with strong e-Skills at all the three levels-practitioner, user,

¹¹ Does the Internet Improves lives? UK Online and Freshmind, March 2009.

¹² Tobias Hüsing of empirica “*Although we see in this crisis that firms are eager to retain their ICT skilled staff as long as possible, we should note that there is significantly more potential short term volatility on the demand side than on the supply side of the labour market. There is natural inertia on the supply side stemming from the educational system and the time it takes for instance to earn a degree in computer science-while lay-offs are linked in a much shorter term to economic developments. So any effort that policy spends to enhance the attractiveness of ICT careers has to bear in mind the enormous lead time and policy must prepare for the post-crisis sooner rather than later.*”

¹³ Their study shows that the recent economic crisis has increased the urgency to address gaps between available ICT skills and what the market demands. This does not concern ICT professionals alone, as ICT skills are clearly needed for any individual to be a marketable and attractive participant in the European workforce, almost regardless of job role and industry sector.

and e-business will be the best placed to emerge quickly from the downturn. In this context, India is interesting case to study. According to experts:

“As the markets in the US and Europe are improving, the Indian software and service export sector is expected to grow by 15- 17 per cent, which is conservative estimate keeping in view the Euro crisis and Rupee appreciation. So there will be more hiring”.

Neglecting development of these skills could have a serious impact on the medium-to long term performance of an organization, and indeed entire regions (INSEAD, 2009¹⁴).

Fourth, the ICT sector accounted for a substantial part of EU-GDP. As general purpose technologies, ICT goods and services are important drivers of productivity growth and economic performance across all sectors¹⁵. ICT enables process and product innovation, and money spent on computing technology delivers gains in worker productivity, which are many times higher than those of other investments. Without necessary e-Skills, investment in infrastructure-for example, ICT infrastructure to support broadband rollout-will have little socio-economic impact. The Office of National Statistics (ONS) has produced a number of studies linking internet access for employees with business productivity. A study into the manufacturing sector, found that on average companies experience a 2.9 per cent increase in productivity for every 10 per cent of employees who are given Internet access. In line with these findings, e-Skills have suggested that through exploiting digital technology, small companies could *“generate an additional 25 billion Pound of gross value added (GVA) over the coming five to seven years”*. At the theoretical level, since e-business skills reduce co-ordination costs between different work processes. With the help of these skills workers can perform their task at greater physical remove. Remote access to e-mail and company documents enable them to perform some or all of their work from home or elsewhere. One potential source of efficiency gain from delivering services remotely is that the hours spent in unproductive commuting may be replaced by rapid online delivery (Sumanjeet, 2008). Therefore, there is need to maximize the impact and effectiveness of ICT investment decisions by ensuring e-Skills not only amongst those who implement the technology but among intended and potential users downturn.

Fifth, as more and more business activities are shifting from traditional commerce to electronic commerce, there has been pronounced shift in labour demand towards high skilled workers. The changing trends in labour demand are not primarily not driven by shift in economic activities, rather they have arisen within most industries, both manufacturing and non-manufacturing industries. What is clearer is the fact that e-commerce cause changes in the skills required, driving demand for information technology industries. This has exacerbated a supply shortage, which has received great attention in the Europe.

¹⁴ See chapter 7, “Who Cares?: Providing Skills for an Innovative and Sustainable Europe”, INSEAD, 2009

¹⁵ The contribution of ICT to the economy is well established based on empirical evidence from growth accounting models that link the production and use of ICT to productivity. There are both short term and long term impacts but these growth accounting models only measure the short-term impact. The long term efficiency gains throughout the economy that are caused by ICT cannot be measured directly. From 1995 to 2000, aggregate productivity in the EU grew by 1.8% per year. At least 55% of that increase was due to ICT. Between 2000-2004, productivity growth fell to 1.1% but the contribution of ICT remained high at around 45%.³ These figures underline the key role of ICT in realizing the Lisbon objectives of competitiveness and growth. The impact of ICT on productivity in the EU has consistently been only half of the impact in the US over the last ten years. From 1995 to 1999, ICT accounted for 0.9% of the annual productivity growth in the EU compared to 1.7% in the US. From 2000 to 2004 the relative figures were 0.5% and 0.9%. The US continues to outstrip the EU both in terms of efficiency gains in the ICT sector and in terms of investment in ICT

Thus, there are many compelling arguments to develop e-Skills in Europe. Lack of these skills will pose not only policy challenges, but also challenges for the enterprises themselves. It is important to note that this is not only the problem for the ICT sector but for all the sectors, both manufacturing and in services. In fact, development of e-Skills is necessary for competitiveness, growth and employment in European nations. This calls for a new form of governance, using all existing policy tools-from education and training to enterprise policy-in a flexible but nevertheless consistent manner.

3. POLICY INITIATIVES TO DEVELOP E-SKILLS IN EUROPEAN PERSPECTIVE

Thus, whether or not e-skills are available in sufficient numbers and quality will determine how European countries succeed or fail as information and knowledge societies. European economies have already realized the potential of e-skills; evidently, European institutions and national governments have pursued their efforts to acquire and develop e-skills. The interest in the e-skills domain basically started at the end of the 2000 in response to the severe shortage of ICT practitioners in Europe. According to EITO/IDC Survey 2001, Europe's ICT skills shortage was estimated at 1.2 million jobs and shortage of e-business skills was estimated at 0.7 million in 2000. The discussion of e-Skills gained momentum when the European Council met in Lisbon (Lisbon Strategy 2000), Portugal, in March 2000 and formulated a strategic goal to

“become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.”

The Lisbon Strategy also highlighted that there is a widening skills gap, especially in information technology where increasing numbers of jobs remain unfilled. To address this challenge, the Enterprise Director-General of the Commission has established in September 2001 an “ICT Skills Monitoring Group¹⁶”, composed of representatives of all Member States, to analyze the demand for ICT and e-business skills in the EU and to monitor the policies and the actions designed to match demand with supply. The strategic importance of e-Skills at the European level was first recognized in March 2002, by Erkki Liikanen, European Commissioner for Enterprise and the Information Society, in his forward to 2002 edition of the European Information Technology Observatory (EITO¹⁷):

¹⁶ The ICT skills monitoring group, established in September 2001 by the Enterprise Directorate General (DG) of the European Commission, is not aiming to replicate the current work being undertaken elsewhere by industry, covering the IT sector or the work being undertaken by Member States and DG Education and Culture to address basic IT skills. The group intends to add value to the debate and definition of demand in the European Union by focusing on the monitoring the demand for ICT and e-business skills across all industries. Both government and industry have a stake in this policy area. EU Member State Governments will need to address the skills that are needed to ensure that the workforce is competent and able to address the changing needs that ICT will impose on the future workforce as well as keeping up with general ICT skills demand. Industry will have a stake in making sure that they remain profitable and economically sound by equipping the workforce with the e-business skills that they need to grow their business.

¹⁷ Since 1993, the European Information Technology Observatory (www.eito.com) offers high quality and up-to-date information on European and global markets for information technology, telecommunications and consumer electronics. The EITO is managed by Bitkom Research GmbH, a wholly owned subsidiary of BITKOM, the Federal Association for Information Technology, Telecommunications and New Media in Germany. EITO collaborates with leading market research institutes including IDATE, IDC, PAC and GfK, and research activities of the EITO Task Force are supported by the European Commission and the OECD. EITO is sponsored by CeBIT, Deutsche Telekom, Discuss & Discover, KPMG, Red.es, Simo and Telecom Italia.

“Despite the current consolidation phase within the ICT sector, one of the biggest concern for European enterprisers remains that of finding employees with ICT and e-business skills.

EITO strongly contributed to the debate, as the EITO Year Book 2001 became a point of reference for the discussion of ICT skills shortage. The EITO Year Book 2001 and several studies commissioned by the ICT industry highlighted the fact that the European industry is suffering from a significant e-skills gap. This has initiated, at different levels, a policy debate about how to better promote e-skills in Europe, in order to fully reap the potential benefits of modern information and communication technologies. As a follow-up of the informal meeting of the Council of Ministers responsible for telecommunications and for employment in Luleå in February 2001, a specific Task Force on skills and mobility was set-up in June 2001. Based on their report of December 2001, the Commission adopted in February 2002 an Action Plan for Skills and Mobility¹⁸. In this Action Plan, the European Commission acknowledges the evidence of a “*shortage in ICT occupations and sectors*” as “*one of the biggest concerns of enterprises*”. With the burst of the Internet bubble a reaction set in, but the Commission kept a strong interest on this issue. The Commission supported industry-led initiatives and instituted expert groups, in particular following the European e-Skills Summit organized in October 2002 in cooperation with the Danish Presidency and Council Conclusion adopted in December 2002¹⁹, the commission established the European e-Skills Forum in 2003²⁰, with representatives of Member States and stakeholders. The forum released a report²¹ “*e-Skills for Europe: Towards 2010 and Beyond*” in 2004. The report also presented a basic framework for the European e-Skills 2004 Conference²² held on 20-21 September 2004 at Thessalonica, Greece (European e-Skills Conference, 2004). According to the declaration issued by the European e-Skills Conference:

“the success of the Lisbon Strategy, the competitiveness of European industry and social cohesion are dependent on effective use of ICT and the knowledge, skills, competencies and innovativeness of the European workforce and its ICT practitioners”.

The conference brought together experts and decision makers from the public and private sectors to discuss e-skills issues, including global sourcing, as well as strategies and best practices to boost e-skills, e-learning, competitiveness and job creation. In June 2005, Europe’s Information Society policies were brought together under the *i2010 strategy* (also

¹⁸ Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and The Committee of the Regions : Commission's Action Plan for Skills and Mobility Com(2002) 72. Brussels 13.2.2002

¹⁹ The European Council emphasized social cohesion, gender issues (that include encouraging women to choose ICT careers); e-inclusion, and the promotion of new ICT professionals and skills (Council Conclusion, 2002).

²⁰ The objective was to bring together all relevant stakeholders to listen to their views and catalyze discussions and actions to address e-skills issues. The Forum brought together experts from the ICT industry, economic and social partners, European associations, universities and training bodies as well as representatives of the Commission, European Centre for the Development of Vocational Training (Cedefop), Member States, acceding and candidate countries, EEA/EFTA countries and OECD.

²¹ The report: “*e-Skills for Europe: Towards 2010 and Beyond*” presents a shared vision of the problem and of the challenges ahead and proposes priority actions to be launched at both European Union and country levels. It draws on four detailed issue papers prepared by the working groups and discussed in plenaries, on supply and demand, managing social change, international aspects and public private partnerships.

²² It was organized around the activities of the European e-Skills Forum and constituted an important milestone after the first European e-Skills Summit which took place in 2002 in Copenhagen.

known as European Information Society 2010) by the European Commission. The new five-year strategy aimed at promoting growth and jobs in the European Information Society and media industries and to provide a comprehensive framework for the development of the digital economy. The Cambridge conference “*e-Business: The Way Forward*” of December 2005 confirmed that major European enterprises see the need for a long term EU Strategy to ensure adequate e-Skills for the future across both workforce and population. The European e-Skills Conference which was basically a high-level conference on e-skills and a key milestone was held in October 5-6th, 2006. The outcomes of the conference were used to prepare a long term strategy in Europe to ensure adequate e-skills for the future across both workforce and population. In the similar year, the Commission established an ICT Task Force (2006) on competitiveness of the ICT sector and ICT uptake in Europe. The Task Force set up six working groups, including one on skills and employability. The Task Force released its final report in November 2006 including recommendations on e-Skills.

In order to help the European Union (EU) upgrade its e-skills, make the better use of ICT and integrate them into the entire spectrum of Union’s economic and social activities, the European Commission launched, in 2007, a strategy entitled ‘*e-Skills for 21st Century: Fostering Competitiveness, Growth and Jobs*’. The Commission of the European Communities concluded:

“for the European Union and its Member States to remain successful in a global economy characterised by rapid technological change, more efforts will be needed to raise and widen the level of e-skills of our workforce and our citizens, which is one of the foundations of a knowledge-based society. This will require major, sustained efforts by both Member States and stakeholders applied to a range of policy issues”.

In September, 2007, the council welcomed the Commission’s proposal to establish a long term e-Skills agenda in response to the need to address e-Skills as a way of contributing to the development of an economy based on knowledge intensive products and services in a more inclusive society. Similarly, the e-Inclusion communication of 8th November 2007 reaffirms the need to promote digital literacy training, notably for vulnerable social groups²³. Policy Declaration 2008²⁴, ‘*E-Skills Competences Actions Towards Sustainability*’ was submitted to the European Council of Ministers in March 2008. Policy Declaration 2008 also highlighted that 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. As the global economy becomes increasingly ICT-embedded, digital illiteracy as well as lack of professional e-skills substantially reduces productivity and the possibilities of the European

²³ EC’s Communication on “e-Skills for the 21st Century : Fostering Competitiveness, Growth and Jobs”, COM (2007) 496, of 7 Sept. 2007, ec.europa.eu/enterprise/ict/policy/ict-skills.htm, approved by Council Conclusions on e-Skills Strategy of 23 Nov. 2007, www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/intm/97225.pdf

²⁴ Recommendations in this Declaration include:

- Support the development of digital literacy training and employability schemes through the utilization of Member State and European funding to amplify the impact of existing private investments;
- Provide a multitude of easily accessible fiscal and financial incentives, supporting notably individuals and small and medium sized enterprises to invest in e-skills using a strategic and long-term outlook;
- Encourage EU Member States to remove barriers for funding education, awareness raising and training to offer ICT curricula and validations in direct connection to market’s demand; and
- Support flagship European initiatives like the European e-Competence Framework and the e-Skills Career Portal under preparation and contribute to their development in close cooperation with institutional players, industry e-skills providers, NGOs, citizens and other stakeholders concerned to bridge formal and non-formal ICT education and training.

citizens and workforce to actively participate in the labour market²⁵. Jose-Manuel Barroso, President of the European Commission also addressed the need of e-skills development in his speech at the Lisbon Council Growth and Job Summit of the Lisbon Council: A Strategy for all Seasons on 4th March 2008 at Brussels.

“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 can not 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”.

The e-Skills Industry Leadership Board, professional users, and practitioners of e-skills, together with providers of industry-based ICT skills credentials, on 9th October 2009 urged the European Commission, the Council and other European Institutions to make the e-Skills Knowledge Triangle a centre piece and key priority of the post-Lisbon Strategy. Further, the European e-Skills 2009 Conference: Fostering ICT Professionalism was held on the 20th November 2009 and addressed the three important topics: (1) the crucial importance of ICT Professionalism for the EU economy and society; (2) the progress of the implementation of the e-Skills strategy and projects; and (3) the road ahead for a coordinated strategy to foster ICT professionalism, e-skills and innovation for economic recovery. The first-ever European e-Skills Week organized from 1-5 March 2010, but the campaign continues until the end of April. The e-Skills Week campaign has been a huge success with nearly 200 events organized in 27 countries.

The European Commission launched in March 2010 the Europe 2020 Strategy to exit the crisis and prepare the EU economy for the challenges of the next decade. The three (out of total seven) flagships recently adopted by the European Commission, a “*Digital Agenda for Europe*”²⁶, “*Youth on the Move*”, and agenda for “*New Skills and New Jobs*” prove that e-Skills are still at the centre of political interest and actions within the European Institutions. e-Skills are an essential building block of European competitiveness in the 21st Century, as highlighted by the President of The European Commission, José Manuel Barroso, in his Europe 2020 Vision and during his recent speech on the “*State of the Union*”. Thus, e-skills are the cornerstone of Europe development agenda.

4. DEMAND AND SUPPLY OF E-SKILLS IN EUROPE

From the above discussion it is clear that as the European economies continue to move towards “*knowledge based societies*”, the role of e-Skills are increasingly regarded as major factors in development and growth. It is now widely recognized that such knowledge based

²⁵ See the November 2007 ITIF study on ICT and EU productivity: “Boosting European Prosperity Through the Widespread Use of ICT”, at: www.itif.org/index.php?id=34; on “Media Literacy” see the EC Communication, “A European Approach to Media Literacy in the Digital Environment”, COM (2007) 833, of 20 Dec. 2007, at: http://ec.europa.eu/avpolicy/media_literacy/docs/com20070833final.pdf

²⁶ The Digital Agenda is built upon wide consultations, in particular on inputs from the Digital Competitiveness Report 2009 - COM(2009) 390; the Commission's 2009 public consultation on future ICT priorities; the Conclusions of the TTE Council of December 2009, the Europe 2020 consultation and strategy; and the ICT Industry Partnership Contribution to the Spanish Presidency Digital Europe Strategy; the own-initiative report of the European Parliament on 2015.eu and the Declaration agreed at the informal Ministerial meeting in Granada in April 2010. All these are available at: http://ec.europa.eu/information_society/europe/i2010/index_en.htm.

strategies have to grant stronger priority to generation of skills in general, and, e-Skills in particular. Studies revealed half of the Europe's productivity gains in recent years are attributable to IT, which is at the heart of new economy sectors from low carbon to biotechnology to space. Therefore, the demand of technology professional workforce, equipped with necessary e-Skills has continued to grow in Europe. The kind of skills needed not only computer skills and the ability to master and combine IT skills but also a more generic set of competencies relating to the ability to communicate across cultural and institutional boundaries, to work in teams, and, more generally to create and share knowledge²⁷ (Table 1).

Table 1: E-Skills based Occupations

<i>High Skilled</i>	<i>Medium skilled</i>	<i>Low skilled</i>
Computer support specialists. Computer software engineers, applications. Computer systems analysts. Computer programmers. Computer and information systems managers. Network and computer systems administrators. Engineering managers. Electrical and electronic engineering technicians. Network systems and data communications analysts. Database administrators. Electrical engineers. Electronics engineers, except computer Computer hardware engineers. Computer and information scientists, researchers.	Data entry operator. Text Processing, automated office. Electrical and electronic equipment assemblers Telecommunications line installers and repairers. Computer, ATM, and office machine repairers Electrical power-line installers and repairers. Telecommunications equipment installers and repairers, exc. line installers. Electrical and electronics repairers, commercial and industrial equipment. Semiconductor processors, Electromechanical equipment assemblers. CAD/CAM Robot handling equipment professionals. Streaming media specialist. Production assistant. E-Business specialist. Network technician. PC Network engineer.	Billing and posting clerks and machine operators. Switchboard operators, including answering service.. Mail clerks and mail machine operators except postal service Computer operators. Office machine operators, except computers Telephone operators. Computerized cash register, product code, integrated storage and stock control. Automated machinery. Automated warehouse. Desktop publishers. Document specialist. Help desk technician. System analyst. Webmaster. Technical writer. Software tester. Technical communicator..

Source: Compiled by researchers from various sources.

²⁷ Further, there are skills which are most affected with the growth of information and technology in Europe. For example, office manager, assistant sales staff and administrative employees has been replaced by automated administration with linked decentralized system. In this way, new jobs require new skills

Thus, the demand of e-Skills runs across the whole European economy, but there are concentrations in particular areas, most notably the ICT supplier industries²⁸ and particularly in the software service industry. Interestingly since 1997 to till date, software service sector employed maximum number of people across the countries. The below table (table 2) shows employment by country broken down by three ICT supplier industries and by the rest of economy, that is the end user in 1997.

Table 2: Employment by ICT Supplier Industries and End-Users in 1999 (in Thousands)

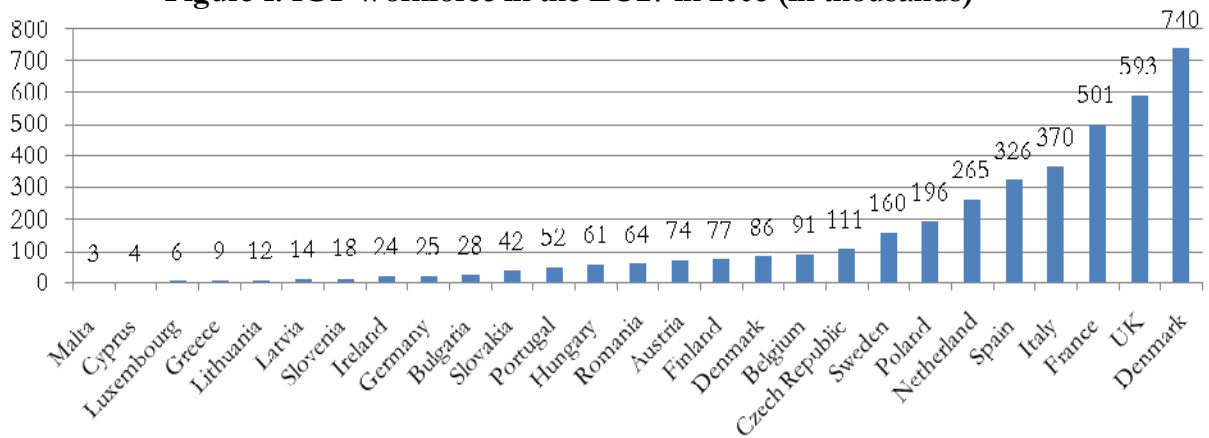
Employment	Manufacturing ICT	Telecom	Other ICT services	End-Users	Total Employment
Austria	39	65	61	3,209	3,374
Belgium	23	30	78	3,612	3,742
Denmark	22	19	55	2,449	2,596
Finland	37	17	34	1,924	2,011
France	238	170	273	21,726	22,407
Germany	373	221	380	31,657	32,631
Greece	5	23	14	3,924	3,996
Ireland	34	12	10	1,370	1,426
Italy	186	180	306	21,496	22,167
Netherlands	78	41	80	5,442	5,641
Norway	10	18	45	1,997	2,071
Portugal	27	21	47	4,574	4,668
Spain	56	73	78	13,967	14,175
Sweden	56	36	79	3,868	4,040
Switzerland	50	29	93	3,527	3,669
UK	303	193	616	24,239	25,351
Europe	1,537	1,177	2,249	149,032	153,965

Source: OECD, IBM, 1997

Looking at the computer professional and computer associate professional in the EU27 member states in 2007, split by industry, around half (45.5 per cent) of the IT professional in Europe work in the core IT industry. Other 55.5 per cent were working in various IT user industries such as financial intermediation, education, public administration, wholesale and retail trade etc. In 2008, there are around 4 million IT professional in Europe, more than double the level of 1995.

²⁸ Until 2001, the ICT sector was among the highest growing segments of knowledge based employment. Overall, the knowledge-intensive and high-tech sectors were the main drivers of employment in the EU with 60% of all jobs created between 1995 and 2000, and 1.6 million new net jobs in 2000 alone. Employment in “computer and related activities” -one of the several components of these sectors-grew at yearly rates above 13% and itself created 1.16 million net jobs between 1995 and 2001.

Figure 1: ICT Workforce in the EU27 in 2008 (in thousands)

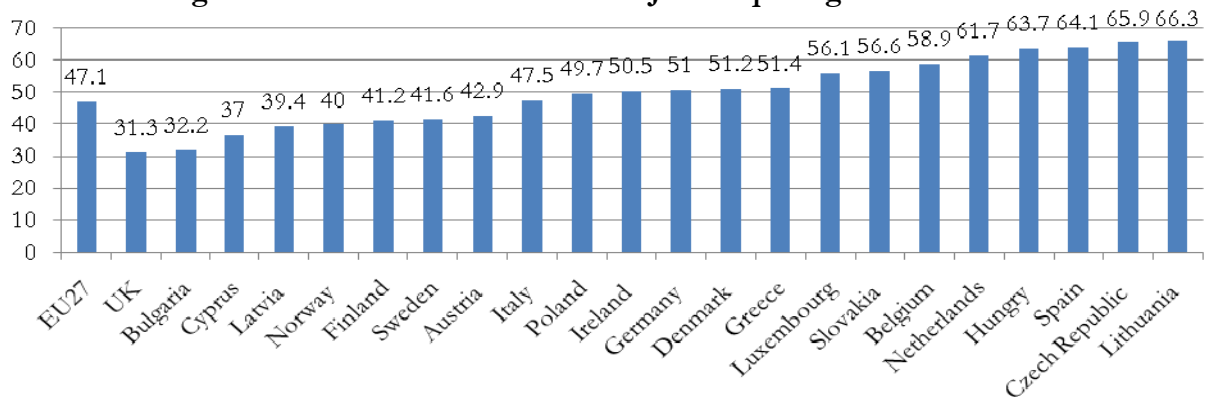


Source: Eurostat Labour Force Survey

Figure depicts that four largest countries, Germany, UK, France and Italy come up with more than half of Europe's labour force, and the seven largest employer member States (Adding Spain, the Netherlands and Poland) account for 75 per cent. Thus, the demand of e-Skills is on move among all the countries. Latest e-Skills Bulletin (August, 2010) investigate that the number of advertised vacancies in UK for ICT staff rose for the third consecutive quarter to 86,000 positions²⁹, even as recruitment activity declined across the economy as a whole. Thus, demand of e-Skills is growing in EU.

But, at the supply front, several studies commissioned by the ICT Industry highlighted the fact that Europe is facing an e-Skills gap i.e. a serious and increasing undersupply of ICT practitioners in the market which is increasingly not reaching the demand levels in industry and among businesses. According to Eurostat Enterprise survey of 2007, 47per cent of enterprises which recruit personnel with ICT specialist skills had hard to fill vacancies³⁰ in this area (Figure 2).

Figure 2: Hard to Fill Vacancies for Jobs requiring ICT Skills



Source: Eurostat Labour Force Survey

Note: Base-percentage of the enterprises which recruited personnel with ICT Skills.

²⁹ Demand for each of the following roles has increased over each of the past three consecutive quarters: Senior Business Analysts ;Senior Test Analysts; Development Team Leaders; Projects Managers, Business Analysts; Senior Systems Developers; Systems Developers; Software/ Programming Managers.

Demand for each of the following skills has also increased over at least three consecutive quarters: Sybase; C#, Coldfusion; .NET; SQL; Swing.

The number of ICT professionals working in the UK was up on the previous quarter, to 1,065,000 people.

³⁰ Vacancy rates are considered as most commonly used indicator for a labour shortage.

Table depicts that more than 30 per cent enterprises in the UK actively recruiting IT professionals claims that they has e-Skills recruitment problem with hard to fill vacancies for open IT professional position. This leaves the UK among the “luckier” countries, while enterprises in Germany and the Netherlands suffering even more from such labour shortage in more than 50 per cent or even 60 per cent of the enterprises in 2006. A recent foresight study anticipates that the EU labour market may face an excess demand of 384,000 ICT practitioners by 2015. The forecasts suggest that even in a “stagnation” scenario, demand will exceed supply in the EU27. In the most optimistic scenario this will even reach 669,000. This amounts to a shortage of either 8 per cent or 13 per cent respectively in Europe, if the developments continue as at present (Table 3).

Table 3: e-Skills Demand Forecast

2010 ³¹				2015		
EU27, Broad Definition of e-Skills	Demand for e-Skills	Supply for e-Skills	Demand/Supply Differences	Demand for e-Skills	Supply for e-Skills	Demand/Supply Differences
Back to Normal ³²	4,852,700	4,876,200	-23,500	5,445,700	5,061,600	384,100
Investing in Future ³³	4,870,800	4,876,200	-5,400	5,445,700	5,067,200	579,500
Turbo-Knowledge Economy ³⁴	4,899,900	4,876,200	23,700	5,445,700	5,285,500	669,100
Tradition Wins ³⁵	4,873,200	4,876,200	-3,000	5,102,300	4,973,500	128,900
Stagnation ³⁶	4,839,500	4,876,200	-36,800	5,038,700	4,952,200	86,500

³¹ 2010 is the starting point for the divergent trajectories of the five scenarios, which become fully apparent in 2015. The risk of the significant e-Skills gap resurfaces again and is relevant for three out of five scenarios, with excess demand reaching 13 per cent of the total ICT employment in the most positive scenario and 11 per cent and 8 per cent levels in the next two scenarios. In the other two scenarios there is only a slight excess demand compared to supply, with a clear potential risk of e-Skills oversupply in some areas, since the model does not allow analysis of potential mismatches for specializations demanded by employers.

³² Back to normal-a return to "before the crisis" moderate growth development model, with ICT-based innovation developing unevenly across Europe. This result in a limited e-skills gap (estimated at 384,000 excess demand in 2015, about 8% of the ICT workforce).

³³ Investing in the future - a scenario of moderate growth similar to the previous one until 2011, when, thanks to decisions to step up investments in ICT innovation and the future Internet, there is an acceleration of economic and ICT growth, expected to increase after 2015. This leads to higher demand for R&D and ICT skills in the period 2012-2015, with an estimated e-skills gap of 580,000 jobs in 2015, about 11% of the ICT workforce.

³⁴ Turbo knowledge economy - the knowledge economy takes off in Europe, thanks to a virtuous circle of productivity and economic growth driven by widespread diffusion of ICT based innovation. ICT careers become more attractive and demand of e-skills grows, leading to an e-skills gap of approximately 669,000 jobs in 2015, about 13% of the ICT workforce, even if the attractiveness of ICT jobs increases, leading to a slight increase of e-skills supply.

³⁵ Tradition wins - after the crisis, an export-driven recovery advantages traditional industries, rather than high-tech and innovative industries, resulting in a combination of moderate economic growth with low ICT growth. The relocation of the ICT industry outside of Europe accelerates and the demand of e-skills from 2010 to 2015 grows very slowly while the attractiveness of ICT careers declines. A small level of excess demand of e-skills remains, but at the same time there are mismatches between demand and supply across the EU, particularly in the countries where the advanced high intensity IT users remain an important presence.

³⁶ Stagnation - a very slow recovery, accompanied by domestic protectionism in the most important countries, discourages innovation investments. The European socioeconomic system struggles to keep up with the

Source: empirica and IDC, e-Skills Monitor, 2009

In addition, research conducted by Microsoft (2009) found that in Europe within 5 years 90 per cent of jobs will require e-skills, across all sectors. The percentage of jobs that require no e-skills is already low and will continue to shrink as demand for more advanced e-skills and skills to use technology-based devices will be required from employees. The research also indicates that Western European countries generally attach higher importance to basic and advanced ICT skills than Central and Eastern Europe. Romania, Poland and Italy expect a strong increase in e-skills to use technology-based devices. The UK stands out with strong demand for basic e-skills. Thus, there is widespread recognition in the European region of an expanding gap between demand and supply of e-Skills.

It is important to note that shortage of e-Skills will be endemic due to technological innovation and the fast growth of ICT activity. This has been observed in particular with the uptake of the internet and its enabled technologies. Regular use of Internet has grown from 43 per cent in 2005 to 58.4 per cent in 2010. Further, Europe leads the world in terms of mobile penetration, with over 570 million subscribers and a mobile penetration of over 70 per cent³⁷. Further demand of e-Skills goes beyond just basic skills to advanced and e-business skills and will continue to grow as a majority of staff is expected to possess e-Skills. European countries have attempted to develop e-Skills, either through expansion of existing training institutions or establishing new ones. The increasing demand of e-Skills has also attracted private sector training companies, from within and outside the region to set up ICT training institutions. In most cases, however, national efforts seem to have consistently underestimated the size of the market for e-Skills. In rare cases where the overall demand and supply balance was achieved, there were imbalances at the individual skill levels: surpluses in some skills and severe shortages in many others.

5. ACTION LINES TO DEVELOP E-SKILLS AT EU LEVEL

From the above discussion it is revealed that currently, there is no evidence for a general quantitative shortage of ICT practitioner skills in the market. At the aggregate level, demand and supply are roughly in balance. If at all, a shortage is mainly experienced by ICT service providers rather than for ICT using companies. Looking ahead, however, there are forecasts that the demand for practitioners might increase stronger than supply in the next five years, resulting in a shortage of about 8% of demand (IDC / empirica, 2009). Far from being an ICT sector issue, Europe's growing e-skills shortage is affecting productivity and the competitiveness of all types of organizations. Further, due to lack of e-skills, millions of European citizens are not able to access ICTs. Their inability to access ICTs deprives them to reap the benefits of ICTs. This has led to a serious issue of *'Digital Divide'*³⁸ between those who are participating in information technology revolution and those who are not (Sumanjeet, 2010). For example, within the EU boundary, Denmark enjoys the highest

emerging economies and tends to close itself ("fortress Europe"), with low ICT investments counterbalanced by IT off-shoring growth. Both demand and supply of e-skills are flat, without growth, and the result is a very small e-skills gap accompanied by mismatches in the e-skills labour market across Europe.

³⁷ This compared with 9 per cent mobile penetration in Africa, 42 per cent in America, and 19 per cent in Asia Pacific.

³⁸ According to OECD (2001) the term 'digital divide' refers to *"the gap between individuals, households, businesses and geographic areas at the different socio-economic levels with regard to their opportunities to access information and communication technologies (ICTs) and their use of Internet. It reflects differences among and within countries"*.

broadband penetration in the world (37%), whereas Bulgaria has broadband penetration on a par with Botswana (about 8%). Added to these, facing competition from the US and Japan but also increasingly from India and China, Europe needs more highly e-skilled professionals of its own. Europe's education and training systems have not kept up with the exploding demand for e-skills. Official European statistics of education indicate that the number of students entering tertiary education have significantly increased since 2000. However, this increase is not reflected in every field of study; computer science is among those that have decreased since 2006 (Katherine and Marcela, 2010). Since 2006, the total number has slightly decreased by 6000 to reach a total of around 148,000 computing graduates in 2007 (Table 4)

Table 4: Total Number of Computing Graduates EU27 (1998-2007)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Computing Graduates	56,923	71,706	82,936	98,672	109,192	122,815	137,460	154,413	150,951	148,029

Source: Eurostat Database

Further, the study of 13 European countries published on 1st December, 2009, sponsored by Microsoft and carried out by research firm IDC, found that 58% of employers believe the education sector is not doing enough to prepare young for the modern workplace. Training for advanced ICT skills will grow significantly over the next three to five years, according to the report, which highlights the importance of certification for ICT professionals. In addition, it says the majority of the workforce will need their skills updated if they are to use technology to enhance productivity. Supply of ICT professional is also decreasing due to retirement of employees and changing occupations. For Europe in general, no data could be identified occupation on IT workers retiring or changing profession. But, a look at the age structure of ICT workforce can be helpful to develop a rough estimate of the number of ICT practitioners retiring in coming years (Table 5).

Table 5: Age Structure of the IT Professional workforce in Europe

Age	Share
0-39	62%
40-49	26%
50-59	11%
60+	1%

Source: e-Skills Monitor Estimation, 2007

Added to this, there are number of different reasons for the e-Skills gap in Europe. They represent not only policy challenges but also challenge for enterprises themselves. And this is not only a problem for the ICT sector but for all the sectors, both in manufacturing and services. This calls for new form of governance, using all existing policy tools-from education and training to enterprise policy-in a flexible but nevertheless consistent manner. To bridge the gap of demand and supply of e-Skills in Europe, some general policy conclusions can be drawn.

First, e-Skills should be viewed as long term policy agenda³⁹. The long term e-Skills policy agenda for Member States and Stakeholders should includes: regular dialogue between Member States and Stakeholders, longer term cooperation between public authorities and the private sector, academia, union and associations through the promotion of multi-stakeholder partnership and joint initiatives include monitoring supply and demand of e-

³⁹ The European e-Skills Forum, The ICT Task Force and the Thessaloniki Declaration called for a long term e-Skill agenda.

Skills, anticipating change in the demand of e-Skills, adapting curricula, assessing the impact of global sourcing on ICT jobs and occupations, and attracting high skilled ICT workers and promotion ICT education on a long term basis. Second, establishment of a ICT Skill Certification Centre should be given serious consideration by the government, private sector and the Region's ICT education fraternity. Maintenance of a high standard in ICT skills and attainment of a certain standard⁴⁰ in the quality of ICT education is an important challenge that every country in the European region face. Certifying skills of ICT professionals as they graduate from their universities and college and over their working life as new technologies appear is apparently urgent need if the goal of quality ICT education and life-long learning is to be attained. The proposed Regional Centre could provide this service to the regional professionals. This would ensure that a certain level of skills be maintained irrespective of where and from which college or institution the professional obtain his or her basic degree or diploma. It is also important to note that ICT professional associations should play a pivotal role in setting, developing and promoting standards in certification. For IT skills standard to be effective, they must reflect the consensus of the industry professional in the IT career field. To ensure the integrity, quality, and continuity of the skills standards, several principles (Brian *et al*, 2003) can be followed: (1) experienced IT workers, who are the experts in their career field, must be used to identify the work performed and the skills, knowledge, and abilities required to be successful; (2) skills standard must represent broad career clusters rather than narrowly defined jobs; (3) standards must be flexible and portable and should be updated continually and (4) integrated skill standard must define work duties in the context of the work setting. Further, the contents of certification programmes must be made more transparent. Third, there is need for continued investment by government development of e-skills in order to keep pace with the changes in technology. Without the necessary skills, investment in infrastructure—for example, ICT infrastructure to support broadband rollout—will have little socio-economic impact. From small companies reviewing their training budgets to government departments making spending decisions to support public policy, the message is clear: maximize the impact and effectiveness of ICT investment decisions by ensuring skills are well established not only amongst those who implement the technology but among intended and potential users downstream. Fourth, there is strong need to increase the output of computer science, math and engineering education by reallocating the budget resources and improving curriculum to meet industry needs. There is need to develop e-learning university courses and modernize the resources and capabilities of the universities. The quality and nature of training provided by the present and potential ICT institution has to undergo significant change. Broad based conceptual education and training will need to be supplemented with skill based education and training, cognitive and analytical skill development. Given the dynamic nature of ICT industry there is need for continuous interaction between the ICT employers and ICT trainers and teachers. Further, there is strong need to integrate education and ICT policy in Europe to generate more IT savvy people equipped with e-skills. Fifth, fiscal stimulus must incorporate or be linked to sensible parallel investment in e-Skills. Training grants, including scholarship can be funded by public or private source of funding. Sometimes the type of funding source gives a first

⁴⁰ There are numerous benefits to IT skills standards. Companies communicate their performance expectations to their employees, educational institution reform their curriculum to match workplace needs, and the skills gap between workforce expectations and student preparation can be closed. Among other major stakeholders benefiting from IT skills standards are businesses, IT professionals, students, educators and government policy makers.

indication of the scale of initiative. Added to this, many other financial incentives can be offered to development e-Skill. For example, government or private sector can launched fully/partially subsidized courses. Loan can be granted for educational and training purposes. Cost reimbursement, tax incentives and education leave scheme are other important financial incentives which are very popular. Sixth, there is strong need to generate awareness about the need of e-skills. Government should convey the message to the people, that e-skills are necessary not only for employment, but also for their social life. Studies clearly revealed that there is a link between digital exclusion and social exclusion (Young, 1999; Castells, 2001; Foley et.al , 2003; Gibbs, 200; Haddon, 1998). To generate the awareness government should promote not only computer and technical education but also develop accurate understanding of opportunities arising from ICT education and careers. It is also important to develop specific efforts to communicate to older people and marginalized groups. There is need to set-up “e-skills information exchange and observatory mechanisms” at both EU and national levels, for e-skills development and certification and for long-term and regular monitoring of progress on the demand for and supply of e-skills, bringing together key stakeholders for the implementation of a long-term and consistent e-skills agenda. Seventh, without a clear institutional structure and support by necessary legal and financial framework conditions provided by national (or regional) governments a multi-stakeholder partnership for e-skills development and certification is likely to fail in the long-run. There are numerous examples where multi-stakeholder partnerships-which started as projects - did not succeed⁴¹ in establishing themselves in the market as a central national and vendor-independent e-skills development and certification institution. Eight, an additional source of ICT practitioners can come from high skilled labour migration. Temporary in-migration can help to meet abruptly increasing demand for ICT professional. But, a relevant number of in-migrants working as ICT professional can produce a significant impact on wages, distorting the level they would reach if only national ICT professionals were available. Therefore, in addition to in-migration from third world countries, ICT professional can also come form internal migration between the member states. The internal migration can help to balance supply and demand of ICT professional between countries where supply is higher than demand and countries where the contrary is the case. Further, the large inflow of foreign graduate level students to the EU is a clear testament to the persistent global attractiveness of its universities and has always been a source of economic strength, as the world’s best and brightest came first to study and then remained in the Europe. workforce and contributed to the European economy after graduation. However, with increasing economic growth and opportunities in many of the countries of origin for EU’s foreign IT-students (over half are from either China or India), it is increasingly uncertain that Europe can maintain its historical ability to hold on to the foreign students educated at its universities. Any decline in

⁴¹ Examples such as e-Pracownik in Poland or ChangePro in Finland can be seen mainly as oneoff activities (ChangePro) or a series of consecutive projects (e-Pracownik). They have a positive impact, but not to the extent achievable if they were running such as a venture at an institutional level under favourable framework conditions and with the continuous support of governments. The German example APO IT also illustrates how the lack of a legal structure and framework conditions supporting institution building, can constrain a wider take-up and diffusion of e-skills development and certification activities in a country. This happened despite the fact that the German Federal Government funded the initial project as well as a follow-up project (KIBNET) supporting the dissemination and communication of its approach and services. These activities only resulted in an operation of consecutive projects on e-skills development and certification, but not in the establishment of the necessary institutional structures for operating the e-skills development and certification services successfully in the market.

Europe retention of foreign IT-related students will rapidly worsen any future IT practitioner skill shortages. Thus, there is need to grow own talent pool.

Last but not the least, the lack of common data and poor understanding of e-Skills issues results in there being no real common ground upon which to discuss e-Skills issues, and therefore, no platform from which to take consolidated action. For these reasons a common platform should be created as a first step to addressing these issues which are vital to the future economic well being of Europe and its citizens. Further, e-Skills gap call for consistent policy responses and a better cooperation between government and private sector.

6. CONCLUDING REMARKS

This paper reveals that as global competition becomes highly knowledge centric, skills related to the specific requirements of information intensive societies are also increasingly strategic. e-Skills are a central aspect of European policies to boost competitiveness, growth and employability of the workforce to maintain Europe's leadership position through to 2020 and beyond. But this vision is just a way off in the EU where e-skills still not seen as a long term policy issue. In the long term, the demand for e-skills and ICT practitioners are on the rise, as the use of ICTs spreads across all branches of the economy. On the supply side however, the number of students graduating from and enrolled into ICT related subjects such as computer sciences seems to be declining in European countries. Huge e-skills gap has been observed within the country and regions. In addition to the demand/supply gap in numbers, there is an increasing skill quality gap. The much bigger e-skills gap sets off several warning signals like it drives the need for companies to pay higher and unrealistic salaries, and encourages job-hopping among skilled practitioners. In addition, employers will have to rely on people who have less experience than required. To turn the situation around, it is crucial for the EU to rapidly adopt a long term e-skills agenda to promote competitiveness, employmentability and workforce development, reduce e-skills gap and be in a better position to address global competitive challenges. Strong efforts need to be made on permanent basis to extend the cooperation between public and private sector, government and institutions to improve human capital, and foster the acquisition and maintenance of e-skills. There must be collaboration between governments, academics, industry partners, and non-governmental organizations to find innovative ways to use the power of technology for improved social and economic development of Europe in 21st century. Among those, IT industry has important stakes to consider and unique responsibilities to assume⁴². The paper emphasizes to integrate education and ICT policy in Europe to generate more IT savvy people equipped with e-skills. Integration of education and ICT policy will result in curriculum changes.

ACKNOWLEDGMENT: While bearing full responsibility for any remaining errors, I would like to thank *Prof. L. N. Dahiya, Prof. S. D. Vashishtha, and Sudhanshu Kumar* for their critical comments constructive criticisms on draft version of this paper. I am also very thankful to Marco Biagi Foundation, Modena (Italy) for financial support.

⁴² Microsoft is committed to the EU Commission's e-Skills strategy and Digital Agenda, and has already launched Skills for Europe project.

REFERENCES

- Ambrosini V., E. Bonfiglioli, and L. Moire. 2006. "Developing the Wider Role of Business in Society: The Experience of Microsoft in Developing Training and Supporting Employability." *European Journal of Corporate Governance*, Vol. 6, No. 4, pp 401–08.
- Brian, L. Hawkins; Julia A Rudy and William H. Wallace (2002) *Technology Everywhere: A Campus Agenda for Educating and Managing Workers in the Digital Age*, John Wiley & Sons.
- Castells, Manuel (2001) *The Internet Galaxy*. Oxford: Oxford University Press.
- Corrado. C.J.. Latieanger and D. Sichel. (2005) *Measuring Capital in the New Economy*, (Ed.) NBER Studies in Income and Wealth Volume 65, University of Chicago Press: Chicago.
- Dertouzos ML (1997). *What Will Be: How the New World of Information Will Change Our Lives*. San Francisco: HarperEdge.
- E-Skills in Europe: Towards 2010 and Beyond, Synthesis Report of the European e-Skills Forum, Final, September 2004. Accessed on <http://europa.eu.int/comm/enterprise/ict/policy/doc/e-skills-forum-2004-09-fsr.pdf>
- European e-Skills 2004 Conference held on 20-21 September 2004 at Thessalonica, Greece accessed on http://eskills.cedefop.eu.int/download/final_declaration_2004.pdf
- Foley, P; Alfonso, X; Fisher, J and Brown, K (2003) *Connecting communities: Tackling exclusion*, Greater London Authority, London.
- Gibbs, D (2001) "Harnessing the information society? European Union policy and Information and Communications Technologies", *European Urban and Regional Studies* 8, 1 pp. 110-115.
- Greenan, N., J. Mairesse and A. Topiol-Bensaid (2001), "Information Technology and Research and Development Impacts on Productivity and Skills: Looking for Correlations on French Firm Level Data", NBER Working Paper 8075, Cambridge, MA.
- Haddon, Leslie (1998) *New Dimensions of Social Exclusion in a Telematic Society*, Brighton: Graduate Research Centre in Culture and Communication, University of Sussex, FAIR Working Paper No. 45.
- Hampton K, and Wellman B (2000). *Net Effects: Social Support, Social Capital, and Internet Use in the Wired Suburb and Beyond*. Paper Presented at the Annual Meetings of the American Sociological Association (ASA) in Washington, D.C., August 12-16.
- Hempell, T. (2002), "Does Experience Matter? Productivity Effects of ICT in the German Service Sector", Discussion Paper No. 02-43, Centre for European Economic Research, Mannheim.
- Hollenstein, H. (2002), "The Decision to Adopt Information and Communication Technologies (ICT): Explanation and Policy Conclusions", paper presented at OECD workshop on ICT and Business Performance, Institute for Business Cycle Research (KOF), Zurich, December.
- IDC Economic Impact Study 2009 Technology & Social Change Group at the University of Washington and European research consultants D-O-T.
- Inklaar R., M. O'Mahony and M.P. Timmer (2005), "ICT and Europe's Productivity Performance: Industry-level growth accounting comparisons with the United States", *Review of Income and Wealth*, Vol. 51, No. 4, pp. 505-536.
- INSEAD (2009) "Who Cares? Who Dares?: Providing the Skills for an Innovative and Sustainable Europe", Background Report Prepared for the European Business Summit 2009, accessed on: http://www.eskills-pro.eu/files/cepis/20091106035616_EBSskillsfinal.pdf

- Jorgenson, D.W. (2001), *"Information Technology and the US Economy"*, American Economic Review, Vol. 91, No. 1, pp. 1-32.
- Katherine Maillet, Marcela Porta (2010) *"Consequences of the Declining Interest in Computer Science Studies in Europe"*, IEEE EDUCON Education Engineering 2010 – The Future of Global Learning Engineering Education, April 14-16, Madrid: Spain.
- Kozma, R. B. (2005) *"National Policies that Connect ICT Based Education Reform to Economic and Social Development"*, Human Technology, Vol. 1, No. 2, pp 117-156.
- Laffarge, Sylvie (2010), *Why e-Skills are increasingly Important for Immigrant Women Looking for Employment in the EU?* Accessed on <http://www.microsoft.eu/Futures/Viewer/tabid/64/articleType/ArticleView/articleId/636/eSkills-helping-immigrant-women-in-Europe-find-employment.aspx>
- Lenvin, Bourno and Martin, Kralik (2009) *"E-Skills: Who Made that Big Dent in My Flat World?"*, Information Technology and International Development, Vol. 5, No. 2, pp 81-84.
- Liebenau, J. (2007) *"Innovation Trends: Prioritizing Emerging Technologies Shaping the UK to 2017"*, UK Department of Trade and Industry, Economic Occasional Papers, No. 8.
- Marianne Kolding; Curtis Robinson and Mette Ahorlu (2009) *'Post Crisis: e-Skills are Needed to Drive Europe's Innovation Society'*, White Paper, Microsoft, IDC-WP 38R., November.
- McGuckin, R.H. and B. Van Ark (2001), *"Making the Most of the Information Age-Productivity and Structural Reform in the New Economy"*, Perspectives on a Global Economy, Research Report R-1301-01-RR, Conference Board, October.
- Meager N and Hill D (2005), *The Labour Market Participation and Employment of Disabled People in the UK, paper prepared for 'Disabled, Working Life and Welfare State' project*, on behalf of the Norwegian Research Council, Brighton: Institute for Employment Studies.
- Mody, A. and Dahlman, C. (1992) *"Performance and Potential of Information Technology: An International Perspective"*, World Development, Vol. 20, No. 12, pp 1703-1719.
- Negroponte, N. (1995) *Being Digital*, New York: Vintage Books.
- Nelson, R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*, Cambridge MA: Harvard University Press.
- Neuman, R. W. (1991) *The Future of the Mass Audience*, Cambridge: Cambridge University Press.
- OECD (1999). *Human Capital Investment*, Organization for Economic Cooperation and Development: Paris.
- OECD (2008), *International Mobility of the High Skilled*, OECD: Paris.
- Policy Declaration (2008), *E-Skills Competences Actions Towards Sustainability, Recommendations to European Institutions, Governments, Industry, and other Stakeholders Concerned*, E-Skills Industry Leadership Board (E-Skills ILB).
- Sengupta, S. (2006) *'Skills Gap Hurts Technology Boom in India'*, New York Times, October 17.
- Sergio Sayago and Josep Blat (2009) *"Older People and ICT: Towards Understanding Real-Life Usability and Experiences Created in Everyday Interactions with Interactive Technologies"*, Universal Access in Human-Computer Interaction. Addressing Diversity Lecture Notes in Computer Science, 2009, Volume 5614/2009, 154-163.
- Stiglitz, J. (1998). *Towards a New Paradigm for Development: Strategies, Policies and Processes*, World Bank: Washington DC.
- Sumanjeet (2008) *"Impact of Internet and E-Commerce on the Labour Market"*, Indian Journal of Industrial Relations, Vol. 43, No. 4, pp 633-644.
- Sumanjeet (2009) *"Social Implications of E-Commerce"*, Journal of Social Science, Vol. 21, No. 2, pp 91-97.

- Sumanjeet (2010) “*Digital Divide in India: Measurement, Determinants and Policy for Addressing the Challenges in Bridging the Digital Divide*”, International Journal of Innovation and Digital Economy, Vol. 1, No. 2, pp 1-24.
- The Commission of European Communities (2007), *Communication from the Commission to the Council, The European Parliament, The European Economic and Social Committee and committee of the Regions, e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs*, Brussels, 7.9.2007, COM(2007) 496 final.
- Thornton P and Corden A (2002), *Evaluating the impact of Access to Work: A Case-Study Approach*, Research & Development Report WAE138, Working Age Evaluation Division, Department for Work and Pensions: Sheffield.
- Triplett, J.E. and B. P. Bosworth (2008): “*The State of Data for Services Productivity Measurement in the United States*”, International Productivity Monitor, 18, Spring, Brookings Institution, pp. 53-70.
- Tuomi, I. (2005) ‘*The Future of Learning in the Knowledge Society: Disruptive Changes for Europe by 2020*’. Background paper prepared for DG JRC/IPTS and DG EAC.
- UNESCO (1996). *Information and Communication Technologies in Development: A UNESCO Perspective*, accessed on <http://www.unesco.org/webworld/telematics/uncstd.htm>.
- Young, Jock (1999) *The Exclusive Society*. Sage: London.