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Exploiting the employment potential of ICTs

Accompanying the document

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN SOCIAL AND ECONOMIC
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

Towards a job-rich recovery

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1. INTRODUCTION

Since the financial crisis began to hit labour markets in 2008, Europe has lost 5.6 million jobs. Recovering this lost ground is only possible if the EU returns to sustained economic growth, which in turn requires European industries and services to retain or regain international competitiveness. In this respect, the capability of industry and services to compete and evolve is becoming increasingly dependent on the innovative and effective use of information and communication technologies (ICTs).

ICTs, together with globalisation, have already altered the global value chains and the economic structure of the world and consequently labour markets too. Whereas twenty years ago globalisation only affected the production of goods and touched blue-collar workers, it now permeates into every sector of the economy. Indeed, specific routine tasks across almost all existing sectors are inevitably affected by the pervasiveness of ICTs. As a result, international competitiveness has become crucial for a much bigger part of the economy and ICTs play a key enabling role in this respect.

Faced with new emerging markets and rising competition from lower-cost countries with a fast growing and increasingly skilled workforce such as in China and India, European enterprises have little choice but to adapt to this new environment. Thus, industry has to be ready to source talents and up its workforce skill levels. In today's technological environment, innovation almost always involves embracing ICTs, which in turn allows for optimisation of business processes, efficiency gains and improved knowledge management processes and, consequently bigger market share.

Hence, if European enterprises take full advantage of the potential of ICTs they will contribute to creating an important number of jobs and enhancing competitiveness. The demand for ICT professionals continues to grow whilst other jobs are disappearing. ICTs help improve business development and growth across all sectors thus creating further employment. Ensuring that EU workers have the necessary higher end skills will help attract investment and prevent loss of key ICT employment to other regions of the world.

In its Communication on "e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs" and its Europe 2020 flagship 2010 Communication entitled: "A Digital Agenda for Europe", the Commission already addressed the conditions that need to be met to exploit the potential of ICTs.

The present Staff Working Document focuses on the impact of ICT on employment in more detail[1]. Thus the focus of this document is on the potential for job creation and the labour market challenges which need to be addressed in order to exploit it. A proposed list of actions for advancing action in this field can be found annexed to the main Communication heading this Employment Package.

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[1] It only partly addresses the concept of Digital Inclusion (the capacity of all citizens to participate in a digital society) since this has been covered recently by a separate staff working document. Communication "European i2010 initiative on e-Inclusion - to be part of the information society" http://ec.europa.eu/information_society/activities/einclusion/docs/i2010_initiative/comm_native_com_2007_0694_f_en_acte.doc

2. DEFINING AND MEASURING THE ICT WORKFORCE

The relationship between ICT and the workforce can be classified into three categories:

- ICT practitioners have ICT as the focus of their work, for example they develop, sell, and maintain or support ICT systems.
- ICT users apply ICT in support of their own work. Typically, this implies the use of common software tools and specialised tools that support business functions within an industry.
- Entrepreneurs and individuals in management positions exploit strategic opportunities provided by ICTs and require a particular set of skills, called e-business or e-leadership skills.

The analysis that follows here on will focus exclusively on ICT practitioners and ICT users.

2.1. Demand for ICT staff: practitioners and users

There are several ways in which ICT affects employment and the world of work. On the one hand, ICTs allow many tasks which had been previously carried out by humans to be automated, thus potentially leading to job losses, in particular with regard to routine tasks. This has a negative impact on the labour market for medium-skilled white collar workers. Although it is difficult to quantify the specific role of ICT in this regard, it forms part of a general long-run trend towards more automation[2]. In any case, as ICT is a global technology this impact is felt everywhere in the world: postponing ICT investments is therefore not an option for Europe.

On the other hand, more and better qualified ICT practitioners, researchers, entrepreneurs, managers and users are needed. For example, the demand for ICT professionals continues to grow. Indeed, ICT practitioners were one of the very few employment categories which continued to grow (at around 3% per year) even during the current economic crisis. As a result, by the end of 2010, 4.1 million Europeans worked as ICT practitioners in the narrowest definition (programmers and computer assistant staff), up from 2.7 million ten years earlier, with another 1.1 million in closely related occupations. It is also important not to confuse the work of ICT practitioners with the ICT sector – 55% of practitioners work in user industries rather than in the ICT industry itself.

2.2. Potential for re-insertion into the labour market…

The employment of ICT practitioners is growing so fast that there are not enough workers to fill all the vacancies available in the sector. According to a recent estimate[3], there will be up to 700 000 unfilled ICT practitioners' vacancies in the EU by the year 2015. The same trend applies in the United States and in the emerging economies of India and China. These developments offer excellent job opportunities for workers who are willing to pursue a career in this field. For advanced ICT professions, this will require a graduate degree in a computer related field or a training certificate provided by an ICT vendor and is thus mostly of relevance for students and younger workers. For many other ICT occupations, a shorter and/or

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[2] On the other hand, ensuring higher productivity and competitiveness thanks to the new technologies also means preserving jobs in Europe in the future.

[3] Report for the European Commission "Anticipating the Evolution of the Supply and Demand of e-Skills in Europe (2010-2015)" Empirica and IDC Europe, December 2009. Updated forecast presented at the European e-Skills Conference on 13 December 2011 in Brussels.

on the job training period will be sufficient, especially for workers with experience in technical or scientific areas. ICT professions are multidisciplinary and extend beyond technical requirements necessitating soft skills such as communication and business related skills (project management, problem solving, creative thinking, team working etc.). ICTs can therefore be a promising option even for workers who become unemployed in mid-career.

…and/or starting your own business

Moreover, the emergence of new digital applications creates the potential for entrepreneurial and talented ICT practitioners to start up their own companies. Since ICT is a global technology and digital services tend to be easily scalable, start-ups in this field usually have a higher growth potential than other start-ups, and thus a significant employment potential as well. Unfortunately, however, so far, most of the start-up and growth activity of ICT and Internet companies worldwide has taken place outside the EU.

ICT facilitates business creation…

ICTs make it much easier to create a new business, thereby enabling more would-be entrepreneurs to pursue their ambition. It does this in two ways. On the one hand, eGovernment services (where offered by Member States) can facilitate and greatly speed up business creation processes. On the other hand, emerging cloud computing services reduce financial stress for new companies by removing the need for up-front investment in any additional ICT hardware other than a terminal. These developments can help speed up payments and establish a payroll thus enabling a business to take off quickly and easily whilst also reducing its risks of failure. The emergence of cloud computing has been estimated to provide an additional 400 000 jobs per year in the EU from 2010 to 2015.[4]

…but needs high-speed broadband

Finally, one should not forget that ICT has the potential to provide even more employment in the future if the network infrastructure is improved. Jobs in ICT nowadays, whether as an ICT practitioner or ICT user, typically require access to the Internet, i.e. the presence of broadband networks. Yet many of the areas with persistently high unemployment have only limited broadband deployment (e.g. rural and remote areas), which limits the potential for future ICT careers for people in these areas. Also, flexible ICT working arrangements such as tele-work are typically only possible where there are high-speed connections, as is cloud computing[5].

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[4] "The Cloud Dividend: Part One. The economic benefits of cloud computing to business and the wider EMEA economy"; centre for economics and business research; OECD IT Outlook 2010 http://www.redstor.com/downloads/cloud-dividend-report.pdf

[5] To enhance improved coverage of broadband connection and ICT applications, the European Regional Development Fund (ERDF) provides about EUR 15 billion to ICT priorities (or 4.4% of total cohesion policy funds) to ensure access to basic Broadband (EUR 2.3 billion) and supporting ICT applications and services for citizens and SMEs (EUR 12.7 billion) in the programming period 2007-2013.

3. LABOUR MARKET CHALLENGES IN RELATION TO ICTs

3.1. The pervasiveness of ICT skills

Most jobs nowadays already require some kind of computer related knowledge. Whilst ICT specialists account for 3.2% of EU employment, advanced ICT users account for six times as many, i.e.18.5% of employed persons[6], ranging from 9% to 31%, depending on the Member State. It has been forecast[7] that, by 2015, 90% of jobs will need at least basic computer skills. Acquiring those skills is thus rapidly becoming a precondition for workers to become and remain employable.

% persons employed with ICT user skills – 2010
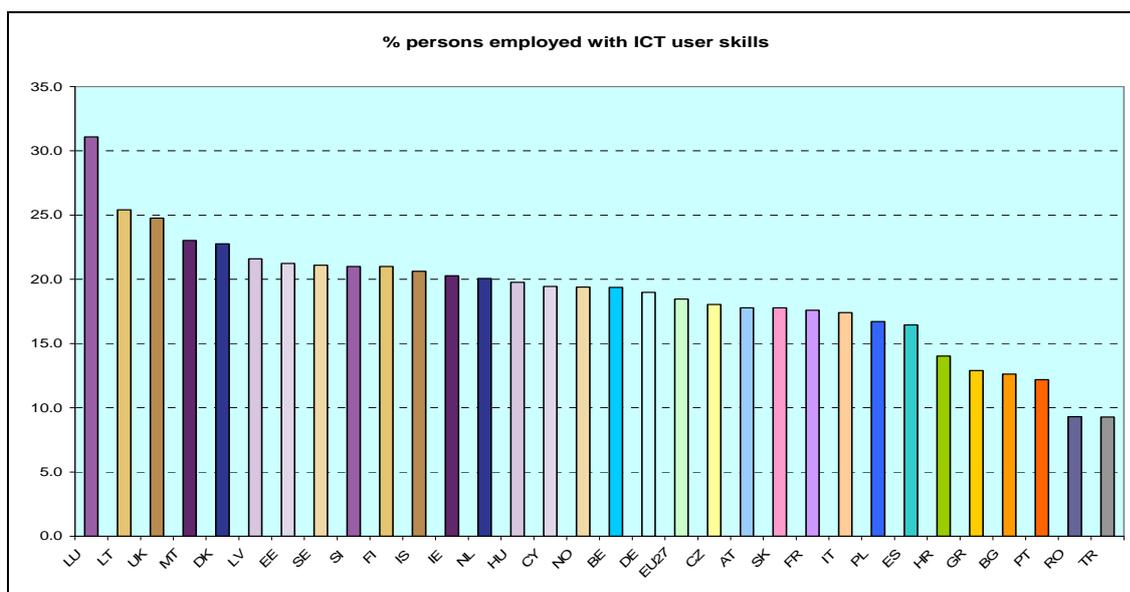
Source: Digital Agenda Scoreboard 2011 (Commission services on the basis of the Eurostat European Labour Force Survey).

3.2. The labour market for ICT practitioners

The labour market for ICT practitioners has been characterised for a number of years by a shortage of supply, i.e. a lack of skilled workers. As a result, there has been a persistently large number of unfilled vacancies, which is often referred to as the "ICT skills gap". The financial crisis has barely affected ICT practitioners: their unemployement rate rose by a mere 0.6% to 1.8% in 2010[8].

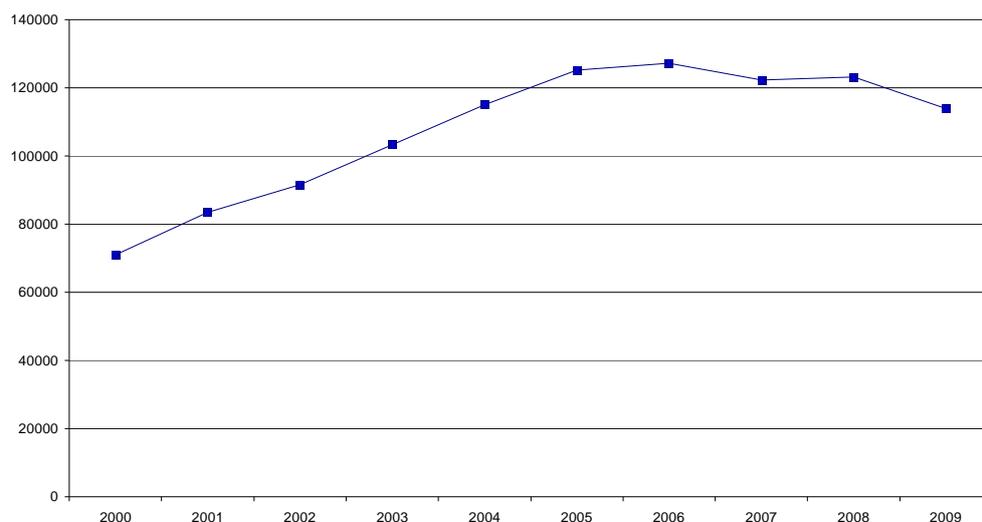**Surprisingly low interest of young people in a career as an ICT practitioner…**

Recent statistics on the number of ICT graduates in the EU give rise to additional concerns. Although their number increased from 71 000 per year in 2000 to 127 000 in 2006, it decreased again in the following years, down to 114 000 by 2009.

Computer science graduates in EU27

An additional complication arises from the increasing number of ICT graduates leaving the work force due to retirement: the number will increase from around 80 000 per year in 2010 to about 120 000 in 2015. As a result, the number of ICT graduates in the labour force could soon actually drop, while the number of ICT vacancies continues to rise.

ICT staff retirement forecasts, EU27
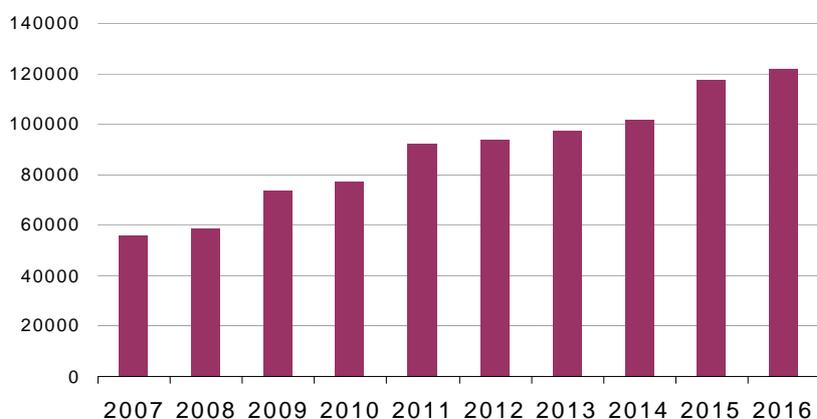
It is intriguing that the number of young people choosing a career in ICT remains so low. On the one hand, there has been a great deal of activity in Member States in terms of stepping up provision for ICT skills and digital competence. This has included curriculum reform, extra funding and resources, new programmes, the creation of virtual learning environments, and the use of ICT in communication, administration and management[9]. On the other hand,

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[9]   See the 2010 joint progress report "Key competences for a changing world" of the Council and the Commission on the implementation of the "Education & Training 2010 work programme" provides the evidence of SEC (2009) xxx and SEC (2009) xxx. Similar results have been obtained through the EURYDICE study 2011.

Internet usage surveys show that regular Internet usage by 16-24 year olds ranges from 87% for the low-educated to 97% for the highly-educated[10].

In other words, virtually all young people now have at least basic ICT skills and are familiar with a number of internet applications[11].

Yet, the number of them who make the jump from 'cool' ICT, such as installing a webcam or converting a song into a different format for their personal listening, to 'boring' ICT, such as entering a graduate ICT programme, a vocational ICT education, or creating their own web company, remains limited. Despite the good employment prospects in the sector labour supply is scarce particularly among youngsters and this reticence to take a career in the field of ICT remains a serious challenge for policy-makers. Often, the difficulty of entering the ICT sector is overestimated. A recent survey in the UK[12] showed that **36%** of students thought that in order to work in ICT they would need a degree in ICT.

Another important reason for this mismatch is that today's youngsters might be 'digital natives', but they are not yet digitally competent[13] in the sense that they are not able to use ICT in a professional, collaborative, critical or creative way. Despite the many initiatives undertaken at European, national and regional level, formal education and training systems have not systematically integrated innovative pedagogical strategies supported by new technologies[14]. At the same time, ICT companies are increasingly providing education and training through commercial or not-for profit initiatives. Recently, some efforts have been made to build bridges between formal education, training and accreditation systems and these new ICT industry led initiatives.

In addition, we have to deal with a gender issue related to the ICT career. Among ICT specialists in the OECD, women still account for a relatively low share of the total workforce and only represent 20%[15] of the overall figure. One of the reasons is that the already small number of women choosing ICT related careers is further reduced by them leaving the sector.

Reorientation of mid-career jobseekers - problem of mobility and cost of the training

A major alternative source of skilled ICT workers has always been unemployed mid-career workers from related fields such as engineering, mathematics or sciences, with adequate retraining, as they usually share the same basic bodies of knowledge. Moreover, for more basic digital technology jobs (such as web site designers, call centre or network administrators) skills can be acquired by those who have a certain aptitude but lack previous formal education in this field. Such courses are often available through informal training

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[10]   http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/pillar/usage_content.pdf

[11]   See also "Eurostat, Survey on ICT usage in households and by individuals, 2011" data on skills related to using office applications, e.g. using excel, presentation software, creating a web page etc.

[12]   CompTIA survey

[13]   Digital competence is one of the 8 Key Competences identified under the "European Reference Framework on Key Competences" (2008); OECD, PISA results on Digital reading, 2011. IPTS, *Mapping Digital Competence: Towards a Conceptual Understanding*, Sevilla, European Commission, and JRC 67075, 2011. http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4699.

[14]   Key Data on Learning and Innovation through ICT at School in Europe: Eurydice, 2011; Pisa Digital reading (2011); STEPS survey (2010). Ferrari, A., Cachia, R., & Punie, Y. (2011). *Educational Change through Technology: A Challenge for Obligatory Schooling in Europe*. Lecture Notes in Computer Science, 6964, 97-110.

[15]   OECD IT Outlook 2010; http://www.redstor.com/downloads/cloud-dividend-report.pdf

centres[16] and non-formal community groups[17]. However, this is not happening as much as it could be, as is shown by the simultaneous existence of ICT vacancies and persistent unemployment among workers in related fields. This can be explained partly by a problem of geographical mobility, as job vacancies and unemployed workers may be in different areas, and partly by reluctance on the part of either workers or companies to invest the necessary retraining resources in terms of training cost and adaptation period. Finally, there is also the question of whether the wage premium for ICT skills is sufficiently high to make such retraining profitable.

3.3.   The labour market for ICT users

ICT skills as precondition for employability in all fields

It is difficult to think of a job in the present day economy that does not require some degree of ICT knowledge. As stated above, 18.5% of workers in the EU can be regarded as advanced ICT users[18]. At the same time as routine jobs are being displaced by ICTs, other jobs become more complex and require more ICT knowledge. The emphasis of the demand from European enterprises is increasingly focusing on higher level problem-solving and entrepreneurial skills to address the needs emerging from cloud computing, cyber-security, green technologies and eHealth applications. Yet, despite the many efforts over the last years, ICT training as part of other (either university or vocational) training programmes is lagging behind the fast-moving development of technology.

Moreover, it is necessary to ensure that workers already in the workforce adapt new ICT applications to their work as they emerge. However, basic ICT knowledge by workers aged over 25, as measured by regular Internet usage, depends much more on educational attainment than is the case for young people. Among 25-54 year olds, 94% of highly educated people are regular users, whereas among the low educated the figure is less than 50%. Among the over 55 year olds, even a quarter of the highly educated do not regularly use the Internet; the corresponding figure for the low-educated is a staggering 80%.

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16   www.interface3.be

17   IPTS study on ICT supporting 3rd sector organisations and social innovation *ePractice Digital Literacy Workshop on Digital Competences for Social Inclusion Actors and Intermediaries*, http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4340 and *Under the Radar: The Contribution of Civil Society and Third Sector Organisations to eInclusion*, http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4339

18   Digital Agenda Scoreboard (Commission services on the basis of Eurostat European Labour Force Survey).

Regular Internet use in the EU27 in 2010 – breakdown by age-education groups
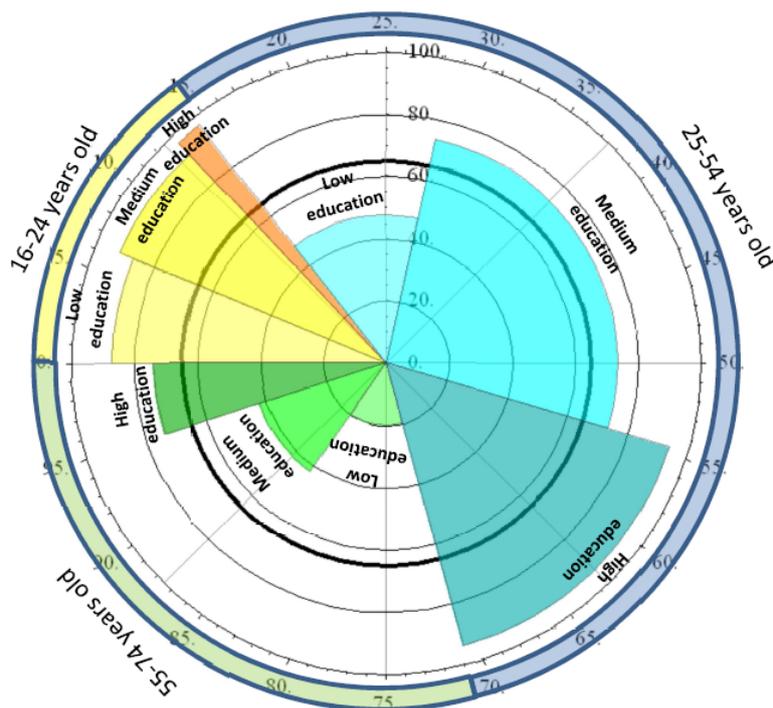
Sector chart: the amplitude of each sector represents the demographic weight of each age-education group in total EU27 population while its height represents the percentage of regular Internet use for that group.
Source: Digital Agenda Scoreboard (Commission services on the basis of Eurostat Community Survey on ICT Usage in Households and by Individuals).

ICT skills can lower the risk of unemployment…

Yet, ICT skills are increasingly important in order to lower unemployment prospects even among senior workers. For example, one econometric study of the Italian labour market, monitoring for age and education and following individuals over time, found that low-educated workers aged between 35 and 49 with no digital skills have a 5% higher probability of being unemployed than those with digital skills; and highly-educated 50-64 workers with no digital skills have a 20% higher probability of being unemployed than those with digital skills[19].

ICTs can also be used to improve one's skills, whether ICT or otherwise. In the EU, jobs held by highly-qualified people in all sectors are expected to rise by 16 million between now and 2020, while those held by low-skilled workers will decline by around 12 million[20]. This enormous task of increasing high level skills and up skilling existing skills, including the digital competences of users can be facilitated by ICTs. For example, by enabling education and training through open and easily available learning resources, open educational practices or the use of open networks.

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[19]   The dataset used provides four different waves of data (2000, 2002, 2004, and 2006). For the illustration of the dataset see Main Report (Codagnone et al 2009), § 8.2.

[20]   "An agenda for new skills and jobs: A European contribution towards full employment" http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/1541&format=HTML&aged=0&language=EN&guiLanguage=fr

New educational practices like virtual mobility can support collaborative methods preparing for new forms of work and at the same time support the development of eLearning, as well as open educational resources. Moreover, eLearning can also provide an avenue for lifelong learning (re-skilling and up skilling), which is recognised as a necessity in today's fast-moving economies.[21]

…and have positive impact on young people at risk of exclusion

Another study on the role of ICT for young people at risk of exclusion[22], relying on a survey of sixty-one ICT based initiatives for the inclusion of youth at risk, shows that the positive short term outcomes reported by these initiatives refer inter alia to re-engagement in education and training and re-insertion into employment. The impacts of ICTs stem from the skilling, empowerment and social capital effects of their use, which are all relevant for employability. A third study found that people who have ICT skills on their curriculum vitae increase the probability of receiving a call-back by 1% or more[23].

The importance of ICT for employment aspects is increasingly understood by workers, too – only 40% of unemployed people consider their ICT skills sufficient for finding a job. Even among employed persons, only 53% believe that their ICT skills would be sufficient if they had to look for another job[24].

3.4.   ICT as an enabling work and social tool

ICTs are a key enabling tool in the development of new forms of work. Thanks to their pervasiveness people can work remotely, on the go from virtual work stations and indeed also according to their own rhythm. This flexibility allows workers to take up employment positions which otherwise would have been too far away or not compatible with other personal obligations such as child or elderly care or with limitations in activities imposed by a disability.

ICT is a key enabler of social innovation, indeed digital social innovation exists thanks to ICT tools and networks. Two broad categories can be distinguished: on the one hand, activities where ICTs increase the effectiveness of existing processes (e.g. Living labs, Web entrepreneurs, Young entrepreneurs, Digital champions, etc.) and, on the other hand, activities aimed at exploiting the enormous potential of the "network effect" ("collective intelligence") to the full in order to find effective solutions to societal challenges.

3.5.   ICT as a tool for better functioning of labour markets

ICTs also play a role in improving labour market matching processes. To start with, 46% of unemployed people use the Internet to look for a job or submit a job application[25]. Moreover, ICTs help employment services to deal with the bulk of their routine requests, freeing up human resources to deal with more complex or sensitive cases in a face-to-face manner. ICTs also allow employment services to complement a traditional repository of job vacancies with

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[21]   IPTS, The Future of Learning: Preparing for Change, Sevilla, European Commission, EUR 24960 EN, 2011. http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4719

[22]   See IPTS study *ICTs for disadvantaged youth: Opportunities and challenges, Policy Report*, Forthcoming 2012, http://is.jrc.ec.europa.eu/pages/EAP/eInclusion/youth.html

[23]   *ICT Skills and Employment: A randomized experiment*, Mariana Blanco (Universidad del Rosario) and Florencia Lopez Boo (Inter-American Development Bank) (November 2010).

[24]   Eurostat Community survey on ICT usage in households and by individuals 2011

[25]   Eurostat Community survey on ICT usage in households and by individuals 2011

additional services, such as online career guidance, self-assessment tools, and databases of training opportunities, e-recruitment and sophisticated real-time labour market information systems.

Moreover, ICT enables better job matching by taking more parameters into account. Skills-based job matching is the most prominent example. By analysing the individual skills profiles of job seekers and the skills required for each job, computer systems can compare how an individual fulfils the necessary requirements of a vacancy. Also, with automated job matching, jobseekers can immediately receive notifications once new job vacancies meet their personal profile. Results of job matching can be presented in a user-friendly way, e.g. by showing job vacancies on a map or by adding information from other data sources.

Concerning recruitment across borders, employers and jobseekers are often separated by large distances. ICT systems are an efficient means to bring jobseekers and employers together. Nowadays, most employers prefer online applications over paper applications. The use of social media for recruitment, virtual job interviews and virtual job fairs are other examples how e-recruitment facilitates communication between employers and jobseekers.