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Benchmarking in a Policy Perspective

Report No. 6

Digital Literacy and ICT Skills

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The data used for the present report comes from the Eurostat Community Surveys on ICT Usage and e-Commerce in Enterprises 2003-2006 and has been provided by Eurostat. No further data quality and consistency checks have been carried out by the authors; the data was used as provided by Eurostat and the European Commission.

Corrigendum

Data presented in this report was retrieved from Eurostat data bases in December 2006. Therefore the report might not fully reflect the data which is available as of now (May 2007). There have been some corrections to the Dutch data which could unfortunately not be incorporated before the editorial deadline.

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1 Introduction to the Project "Benchmarking in a Policy Perspective"

1.1 Objectives

The project "Benchmarking in a Policy Perspective" was started by the European Commission in January 2006.

The objective of the "Benchmarking in a Policy Perspective" project initiated by the European Commission is to carry out an in-depth analysis of the results of the annual Information Society Surveys of households and enterprises and to relate them to a number of specific themes. The aim is to address areas beyond simple ICT connectivity and highlight intensity of use and wider impact on individuals, enterprises and communities.

1.2 Expected Outcomes

The project develops Topic Reports for which an in-depth analysis of available survey results is carried out. Up to now the following reports have been produced. Further reports will potentially include the topics e-commerce and trust, and security and consumer protection. A summary of key findings will be delivered at the end of the project.

Table 1-1 Topic Reports produced by the project "Benchmarking in a Policy Perspective

No.	Topic	Date
1	e-Business and the reorganisation of business processes	March 2006
2	Use of broadband	May 2006
3	Take up of advanced services	July 2006
4	Use of public services on line (including eGovernment and eHealth)	September 2006
5	Inclusion	November 2006
6	Digital literacy and ICT Skills	April 2007

Each topic report covers the following items:

- Review of the basic concept and policy issues related to the theme,
- An analysis of past and current Community survey results to provide an overview of progress in the EU,
- A comparison with existing empirical evidence on the same issue to assess the robustness of the results and provide additional qualitative analysis,
- An investigation of international sources to compare EU achievements with its main competitors,
- A proposal for re-wording or expanding the questionnaire used by EUROSTAT for future surveys.

2 Research Approach and Methodology

An identical work procedure will be implemented for the development of each of the Topic Reports, each including the following tasks:

1) *Topic Area Definition, Review of Concepts and Policy Issues:* Definition of topic area and review of basic concept in the area; review of key policy issues related to the theme;
2) *Current Situation and Progress – Empirical Evidence from EU Surveys*: analysis of past and current Community survey results to provide an overview of progress in the EU;
3) *Validation of EU Statistics Using Data from Other Sources:* comparison of findings from EU surveys with empirical evidence on the same issue available from other sources (industry data; surveys conducted on behalf of member states, etc.) to assess the robustness of the results and provide additional qualitative analysis;
4) *Comparison with USA, Japan and other OECD countries:* investigation of international sources to compare EU achievements with its main competitors;
5) *Future Developments and Recommendations for Survey and Questionnaire Design*: identification of gaps and specification of further research needs relating to indicator development, monitoring and benchmarking and the requirements and implications for future action; concrete proposal for re-wording or expanding the current EUROSTAT questionnaire.

These tasks will be performed in each report.

3 Topic Area Definition, Concepts and Policy Issues

The availability of adequate skills for developing, implementing and using information and communication technology (ICT) is an important condition for the competitiveness and the innovation capabilities of the European economy. The skills which are required go far beyond the narrow confines of ICT practitioner skills within the ICT industry, but also comprise ICT practitioner skills in user industries, ICT user skills and e-business skills, as defined by the European Skills Forum in its Synthesis Report[1]. The experience in recent years has shown that implementation of e-business applications, in particular, is increasing the demand for individuals with creativity and higher-level conceptual skills which are only indirectly related to ICT, and as such are at risk of being neglected in the ongoing discussion about skills shortages in the ICT domain.

This development is one of the reasons why the issue of e-skills shortages, gaps and mismatches continues to be of major importance for ensuring competitiveness of the European economy in spite of the post-"Internet bubble" downturn in demand for ICT practitioners in the ICT industry itself. In fact, although the significant e-skills shortages, gaps and mismatches, which in 200/2001 at the peak of the first internet business surge alerted policy to rapidly react, do not seem to be as serious today, it is impossible to predict whether this will not be the case again in the medium term. As the e-Skills Forum Synthesis Report makes clear: "e-skills is not an issue to be dealt with, and then dismissed". Quite the contrary, the issue is bound to stay with us in the years and decades to come.

There is widespread consensus that improving the availability of e-skills involves actions both at European and national level, in several areas including, of course, education, training, research and industrial and labour policies, but also stretching out to other domains such as immigration, taxation, and quality of life – to name just a few.

3.1 Definition of Topic Area and Basic Concepts

3.1.1 Skills and the Information Society

The societies of European countries are undergoing a stage of profound change, a phenomenon for which the terms information society, knowledge society or network society are being used in the public debate. Key to understanding these changes are shifting modes of production, away from a predominance of industrial and "Fordist" production towards what leading scholar Manuel Castells calls "informationalism", which means "that the defining activities in all realms of human practice are based on information technology, organized (globally) in information networks, and centred around information (symbol) processing".

Change of this scale has profound implications for skill requirements as well as the means and processes with which skills are acquired, and the effectiveness of the structures within which skills are provided.

In short, and focusing firstly on skills on the labour market, new skill requirements follow from the concepts of the information society and the knowledge economy for a number of reasons

- **Size of ICT industry:** The technology that underpins the information society, namely ICT such as the Internet, itself forms an industry of considerable size. Companies operating in this industry depend on the availability of skills that are in line with the dynamic requirements of the market. As in other industries that rely to a great extent on innovation as their main driving force, specific skills that have

[1] E-Skills for Europe: Towards 2010 and Beyond. http://ec.europa.eu/enterprise/ict/policy/doc/e-skills-forum-2004-09-fsr.pdf.

been acquired in the past are in danger of becoming obsolete extremely fast; they are constantly being replaced by new skill requirements.

- **ICT affects the whole economy:** The nature of ICT-related innovation implies that ICT is a basic technology that affects the foundations of the whole economy in one way or another. It impacts on all economic sectors, as ICT are applied throughout the economy to increase productivity and enable innovation. Consequently, ICT-related skills are in demand in all companies, either as specialist skills for the operation and maintenance of ICT equipment, or as user skills for applying the technology to support the aims of the organisation.
- **Widespread private ICT use:** People (as citizens or consumers) need skills in using ICT. This is not only a matter of personal benefit, but also of public interest, such as in the area of civic participation enabled by ICT. Moreover, while these skills are not directly related to the competitiveness of companies, the reality shows that companies benefit from being located in well developed domestic markets in which they can test their products in. The more advanced a population is with respect to the availability of ICT user skills, the better the conditions for its companies to gain a competitive edge through innovation. Countries such as Japan, Finland and Sweden are good examples in this regard, as they all boast highly competitive mobile telephony/computing industries which have developed on the back of early, widespread diffusion of national mobile telephony markets.
- **Shortened skill lifecycles:** The application of ICT also affects the demand for skills that are not related to ICT themselves. These indirect effects result, in particular, from the shortening of product life cycles that is being enabled by technology. The intensity of research and development associated with creating new products has steadily increased. Competitive forces are bound to lead to a further acceleration of the process of translating innovation into marketable products and processes. As new products and processes are associated with new skill requirements, skill life cycles, too, have shortened and will decrease further in the future. Current estimates put the average half-life for technical knowledge at 3-5 years and estimate that complete obsolescence sets in after 6-10 years.

The increasing speed with which market environments change with regard to technology, the structure of the economy and the regulatory framework, have affected the role of skill requirements in society at large as well as at the personal level. It is now clear that the provision of skills must be constantly adapted to account for changes in skill requirements. Traditionally, basic skills and qualifications that are necessary to compete in the labour market were acquired in the stages of formal education in school, vocational training, universities, gradual schools, etc. These set the ground for following stage(s) of gainful work. In the information society, training and working must to some extent take place in parallel, interacting with each other – one of the core aspects behind the concept of Lifelong Learning. It has become obvious that a shift towards widespread if not universal lifelong learning requires a total re-evaluation of existing systems of formal, non-formal and informal education.

With regard to the interests of employers, the public debate has recently put much emphasis on knowledge management and the interaction of human and social capital. There is some kind of consensus emerging amongst management experts that there is a need for significant efforts to be put into training of existent staff, as acquiring new skills through new recruitment on the labour market involves high transaction costs and the loss of tacit knowledge embodied in existent staff. In addition, it is also made difficult when skill shortages or mismatches exist in the labour market.

3.1.2 Definition of e-Skills

The above mentioned e-Skills Forum defines three categories of e-skills (see footnote 1):

ICT practitioner skills are the capabilities required for researching, developing and designing, managing, the producing, consulting, marketing and selling, the integrating, installing and administrating, the maintaining, supporting and service of ICT systems;

ICT user skills are the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work, which is, in most cases, not ICT. User skills cover the utilisation of common generic software tools and the use of specialised tools supporting business functions within industries other than the ICT industry;

e-Business skills are the capabilities needed to exploit opportunities provided by ICT, notably the Internet, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, and to establish new businesses.

3.2 The e-Skills Policy Context

Since the Luxembourg Summit on Employment in 1997 at which the European Employment Strategy was born, analysis and improvement of the skills situation in Europe have been high on the agenda of the European Commission as well as Member States' governments. Against the background of rising unemployment rates on the one hand, and increasing skill shortages on the other hand, EU governments realised that the European workforce needs to develop adequate skills and that skills mismatches need to be solved in order for the EU to remain competitive against the economies of the rest of the world. The changes in connection with the rapid development of information and communication technologies (ICT) were identified as playing a key role in fostering new skill requirements.

Because of the central importance of e-skills for a number of policy fields, policies to improve the skill situation are integral parts of various EU initiatives.

Since the year 2000 the European Employment Policy has had a focus on training and skills, as can be seen in the annual Employment Guidelines. Pillar I ("Improving Employability") asks Member States to increase their efforts with regard to skills related to the information society, and to lifelong learning.

In 2001's Communication on 'Making a European Area of Lifelong Learning a Reality', ICT skills are identified as essential for employability and productivity, and also as a major example of skills which need to be continuously updated because of the fast-changing nature of the technology and the applications based on it. The Memorandum on Lifelong Learning defines lifelong learning as "encompassing all purposeful learning activity, whether formal or informal, undertaken on an ongoing basis with the aim to improve skills, knowledge and competence".

The eEurope 2002 Initiative dedicated one of three objectives to the issue of e-skills (Objective 2: Investing in people and skills). Actions which were directly related to skills in the information society included those listed under the action line "European youth into the digital age" and the following:

- Give the labour force the chance to become digitally literate through life-long learning.
- Significantly increase information technology training places and courses and promote gender equality in such courses (both in work and in educational institutions), using European Social funds where appropriate.

- Establish a European diploma for basic information technology skills, with decentralised certification procedures.

The successor initiative eEurope 2005, which followed a more focused approach, dealt with e-skills under the action line “modern public online services”, containing the policy actions:

- Implementation of a specific eLearning Programme;
- Establishment of virtual campuses for all students (all universities to offer on-line access for students and researchers);
- Establishment of a university and research computer-supported co-operative system (research and piloting actions to enable the deployment of Europe-wide computer-supported networks and platforms);
- Re-skilling for the knowledge society ([...] provide adults with the key skills needed for the knowledge society, to improve their employability and overall quality of life).

The eLearning Action Plan published in March 2001 follows on from the “eLearning. Designing tomorrow’s education” initiative started in May 2000 and is integral part of the eEurope Action Plan. The document includes suggestions for concerted key measures for each of its lines of action (infrastructure, training, services and content, cooperation).

In early 2002, the European Commission presented an Action Plan for skills and mobility, as foreseen in the Communication on New European Labour Markets, and building on the work of the High Level Task Force on Skills and Mobility which submitted its final report in December 2001. This Action Plan is primarily concerned with how to achieve a “skilled and adaptable labour force”, which is seen as essential for meeting the Lisbon objectives of “more and better jobs, greater social cohesion and a dynamic knowledge-based economy”. With regard to ICT-related skills, the Action Plan calls for

- providing all citizens with access to the acquisition of ICT skills (making use of e-learning to assist a wider range of learning);
- increase the numbers of students, especially girls and women, in ICT related fields of education;
- improvements in the mobility of ICT specialists between companies and countries.

The skill mismatch has also been picked out by DG Enterprise as a central theme via its GoDigital initiative promoting adaptation of ICT-based business processes in SMEs. The Communication on ‘Helping SMES to "Go Digital"’ emphasises the shortage of ICT specialists on the labour market as a key obstacle to the further penetration of ICT and e-commerce in European business, as it becomes increasingly difficult for SMEs to recruit experts. The initiative included three Actions under the Action Line “ICT skills”, among them to set up joint initiatives between industry and education for the definition of new requirements for ICT skills and to adapt education curricula accordingly; and the launch of an SME trainee programme.

One of main initiatives stemming from GoDigital is the ICT Skills Monitoring Group which presented its final report on ‘E-Business and ICT Skills in Europe’ at the Copenhagen eSkills Summit in October 2002. CareerSpace was a related initiative by the Europe’s ICT industry (EICTA) and a number of high-profile ICT companies with the objective to define ICT generic job profiles.

The GoDigital benchmarking report of national policies was developed and discussed at the European e-Skills Summit which was organised in co-operation with the Danish Presidency on 17-18 October 2002 in Copenhagen. The Council adopted Conclusions on 5 December 2002 welcoming in particular the proposal of the Commission to establish a forum to foster an open dialogue between all relevant stakeholders.

This was the starting point of the **European e-Skills Forum**, which the Commission established in March 2003. This was a time when public interest in e-skill shortages declined due to the bust of the so-called "Internet bubble" and the resulting fall in demand for ICT practitioners within the ICT industry. As the e-Skills Forum was able to show through its work (which included release of four issue papers and a synthesis report, and a major conference in September 2004), there is no reason at all to feel complacent about e-skills availability in Europe. However, there is a need to be more specific about the types of skills needed, about time horizons, about new challenges emerging (such as intercontinental outsourcing) and about the need for structural changes to the European systems of formal, non-formal and informal education.

A Declaration was adopted supporting the analysis and the recommendations of the Forum, inviting the EU to adopt a comprehensive strategy for improving ICT skills and training and recognising that the way forward is through multi-stakeholder dialogue and partnerships for actions.

The synthesis report of the e-Skills Forum points out that multi-stakeholder partnership is a more general concept than public-private partnerships. "It builds on the idea that in order to reap the full benefits of ICT, it is necessary to create a new form of collaboration that involves the full range of actors in the public and private sectors in a process that is inclusive, open and participatory". Multi-stakeholder partnership promises to stimulate cooperation on training and certification between formal education/training systems and industry, and to bridge these two worlds which have traditionally been quite separated in most European countries.

The Forum recommended to better structure and pool resources for joint activities, sharing of knowledge and exchanging of good practices. Some promising initiatives have already been launched by stakeholders, notably by ICT companies, such as the Cisco Networking Academy Program.

In the meantime, a study commissioned by DG ENTRI and delivered in September 2005 analysed the available evidence, qualitative and quantitative, on the supply and demand of e-skills in Europe. The study clearly showed that the data available is not sufficient for painting an adequate picture of the e-skills landscape in the EU. Even more so, predicting future skills shortages, gaps and mismatches is made very hard given the lack of statistical information. A new project will be launched to explore the possibility for e-skills foresight scenarios. This activity started in March 2006 and is supported by a service contact.

i2010

In the **i2010** policy strategy, ICT skills and digital literacy goals are an integral part of eInclusion priority[2]. It is there that the European Commission has announced to propose a European Initiative on e-Inclusion in 2008, which addresses digital literacy among other objectives.

As part of the Benchmarking i2010 process agreement was achieved on the development of specific survey modules on e-skills for the inclusion into the Eurostat Community Surveys on ICT Usage and e-Commerce in Enterprises 2007 and the ICT Usage in Households and by Individuals survey. These questionnaire modules (Module E) have already been fixed.

In order to complement the CareerSpace initiative (mentioned above) which defined ICT generic job profiles (published in 2001), Cedefop published in 2005 a proposal for a European e-skills reference framework, covering all skill levels and the variety of ICT manufacturing, business and work areas in the European economy. The focus of Cedefop's work was on ICT practitioner skills at non-university and vocational level. On the basis of this

[2] i2010 – A European Information Society for growth and employment. http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm

proposal, a CEN Workshop Agreement (CWA) has been released in September 2005 covering a state-of-the-art review of progress in ICT practitioner skills frameworks, explanation of the realities within which such frameworks are developed and recommendations for next steps towards a European ICT Skills Meta-Framework.

After the e-Learning conference organised on 19-20 May 2005 in Brussels it has been decided to benchmark policies and initiatives in support of e-learning for enterprises. This activity will start in 2Q2006 and be supported by a service contact to be carried out by MENON EEIG.

The latest European e-Skills Conference took place on 5-6 October 2006 in Thessalonica, Greece. The Declaration of the conference emphasised again the need for Europe to ensure that the knowledge, skills, competences and inventiveness of the European workforce meet the highest global standards, and that they are constantly updated in a process of effective lifelong learning. To this end, the declaration calls for efforts "to improve co-operation between the public and the private sectors on a balanced and long term basis and to ensure a seamless framework linking basic e-skills training, vocational and higher education and professional development for the benefit of the workforce".

This means that "the way forward towards the widening and deepening of e-skills within the EU is through involvement of all actors from government, industry, social partners and academia in multi-stakeholder dialogue and partnerships for action". In this context the Commission (DG ENTRI) has recently (November 2006) launched a study on "Benchmarking Policies on Multi-stakeholder Partnerships for eSkills in Europe" which will deliver its results in late 2007 (www.eskillspolicy-europe.org).

3.3 Metrics and Indicators

There are a number of ways in which ICT skills could be measured, for instance through measuring the acquisition of certified skills (in educational institutions or further education, lifelong learning), through measuring at the individual level (either by testing or asking) actual single skills items and through indirect measures such as wage levels or practitioner work contents.

At the individual level, ICT skills and digital literacy could generally be gathered using at least three different approaches: a) in depth examination of user skills through observation or in actual test settings, b) surveying retrospect reporting of actually carried out ICT related behaviour and c) surveying perceived skills levels.

On the other hand, there are macro-level indicators of skills levels that include labour market data (vacancies, number of IT occupations, unemployment and wage levels of practitioners) and educational data (number of vocational degrees and third level graduations) that give a more indirect indication of an economy's overall level and scarceness of ICT skills.

In depth examinations are seldom used in large scale social sciences studies because of the costs and organisational effort involved. The international student assessment study PISA is probably the largest such study, albeit non-ICT. An example in the ICT area is a smaller study by Hargittai[3] who has carried out "in-depth measures of online skill", in which participants (n=100) performed tasks in a research setting. The recorded actions were later analysed as to whether certain goals were accomplished and the time needed. These performances were accompanied by a survey of self reported ICT knowledge, which was also tested afterwards. Generally, high correlations were found between the self-reported knowledge measures and people's actual knowledge. The self-reported ratings also showed

[3] Cited in Hargittai, Eszter, 2005: Survey Measures of Web-Oriented Digital Literacy. In Social Science Computer Review 23(3) 371-379.

significant correlation with the actual task carried out successfully and with the time needed for this (negatively).

Using this method, Hargittai finds those seven items that are best able to predict the level of successful completion of task and of time needed. These are self-reported ratings of knowledge about the following things: MP3, preference setting, refresh or reload, newsgroup, PDF, advanced search, and download. The self reported familiarity with each item on a 5-point scale leads to an index (Cronbach's alpha =.89) that Hargittai proposes as compound measure of digital skills.

However, for the different linguistic and cultural context, it is impossible to say whether such a compound index would be easily transferred to Europe.

In the context of the European e-Skills Forum, the RAND corporation produced a study on the supply and demand of e-skills in Europe. The study found that

> *"there is comparatively very little consistent, reliable quantitative evidence available in relation to clarifying the factual situation of the supply and demand of e-skills at the European level."*[4]

The RAND study focuses on labour market related e-skills data and on certifications or positions. RAND proposed seven indicators that were to measure the supply and demand for ICT practitioner skills:

(1) Unemployment in e-skilled occupations;

(2) Number of graduates in educational fields of relevance to e-skills;

(3) Number of issued training certificates for training of more than a minimum amount of days;

(4) Current employment in e-skilled occupations;

(5) Unfilled or hard-to-fill job vacancies in e-skilled occupations;

(6) Replacement demand; and

(7) Replacement of jobs by off-shoring activities. (ibid.)

The ICT surveys carried out by Eurostat and the European national statistical institutes have contained measurements of e-skills since 2005 and can be regarded as one of the world's largest monitoring of e-skills or digital literacy. The upcoming 2007 survey will feature an enhanced e-skills module.

The approach in the ICT household surveys is using questions about real behaviour. The 2005 and 2006 modules measure e-skills via lists of computer related and internet related activities (six each) that respondents may or may not have already carried out. As skills level in the European population including a wide age bracket, all sorts of employment situation and educational level, the spectrum of skills covered needs "'low entry' questions, at least as a starting point"[5]

[4] RAND Europe: The Supply and Demand of E-Skills in Europe. September 2005: http://ec.europa.eu/enterprise/ict/policy/doc/eskills-2005-10-11.rand.pdf

[5] Demunter, Christophe: ICT Skills Measurement in Eurostat's Information Society Statistics. Paper submitted for the Conference "Knowledge Economy – Challenges for Measurement", Luxembourg, 8th and 9th December 2005

Computer related activities surveyed are

Which of the following computer related activities have you already carried out?

a) Copying or moving a file or folder

b) Using copy and paste tools to duplicate or move information within a document

c) Using basic arithmetic formulas in a spreadsheet

d) Compressing files

e) Connecting and installing new devices, e.g. a printer or a modem

f) Writing a computer program using a specialised programming language

Internet related activities are:

Which of the following Internet related activities have you already carried out?

a) Using a search engine to find information

b) Sending e-mails with attached files (documents, pictures, etc.)

c) Posting messages to chat rooms, newsgroups or an online discussion forum

d) Using the Internet to make telephone calls

e) Using peer-to-peer file sharing for exchanging movies, music, etc.

f) Creating a web page

Furthermore, a first question asks respondents who ever used a computer if and when they have last taken a training course (of at least 3 hours) on any aspect of computer use. Those respondents who answered positive to at least one of the skills items were further asked where they have obtained their e-skills. These questions can also be linked to the three skills levels obtained from the self-assessment questions.

Where or how did you obtain the skills to carry out these activities? (tick all that apply)

a) Formalised educational institution (school, college, university)

b) Training courses in adult education centre (but not on the initiative of your employer)

c) Vocational training courses (on the demand of the employer)

d) Self-study using books, cd-roms, etc.

e) Self-study in the sense of learning-by-doing

f) Informal assistance from colleagues, relatives, friends

g) Some other way

4 Current Situation and Progress – Empirical Evidence from EU Surveys

4.1 Computer and Internet Related Activities

Four of the six computer related activities surveyed have been carried out by more than fifty percent of the computer users: About four in five computer users each have copied a file and copy-pasted in documents or otherwise on the screen. Almost three in five computer users have used spreadsheet software to do at least basic calculations, as many have already connected and installed new devices such as a printer or modem to a computer.

Table 4-1 Percent of computer users[6] having carried out different computer related activities (2006)

	copied or moved a file or folder	used copy or cut and paste	used spreadsheet	compressed files	connected and installed new devices	written a computer programme
EU25	80.5	77.8	56.6	43.5	56.9	13.3
EU15	80.5	78.7	57.3	44.5	59.4	13.9
NewMS	80.0	72.5	51.9	37.6	41.5	9.8
Eurozone	82.0	79.9	57.1	45.7	60.6	13.5
BE	78.9	69.4	54.2	41.6	49.5	10.2
CZ	81.3	74.4	52.2	45.7	33.7	6.5
DK	84.1	80.2	69.6	47.8	61.8	20.7
DE	81.6	80.2	59.5	39.0	61.6	13.1
EE	69.7	66.9	63.8	51.7	47.0	17.9
EL	96.9	79.3	52.6	49.7	58.2	12.6
ES	83.6	80.5	54.2	57.1	59.9	18.6
FR	78.0	77.6	53.5	43.0	61.6	11.0
IE	72.4	68.6	52.3	38.6	42.4	10.8
IT	87.8	87.2	59.5	51.2	65.6	14.9
CY	85.1	83.4	62.4	43.6	67.8	13.9
LV	76.2	72.2	49.8	35.2	26.2	6.0
LT	88.5	82.9	61.3	47.4	39.1	9.4
LU	83.5	81.7	62.5	59.1	66.9	24.1
HU	87.1	87.8	75.6	50.3	60.0	14.6
NL	80.7	81.1	54.7	51.5	60.8	10.0
AT	86.0	83.5	65.8	53.8	55.3	15.5
PL	76.5	65.9	41.5	30.1	38.4	9.3
PT	83.6	78.3	65.3	53.4	51.9	13.0
SI	83.4	78.4	66.1	52.5	58.3	13.0
SK	84.9	77.0	62.7	34.4	39.7	8.7
FI	74.0	71.6	55.5	41.4	57.6	19.1
SE	78.7	78.4	58.5	39.1	60.1	14.1
UK	74.0	72.9	56.8	39.9	54.0	14.9
BG	76.7	69.0	49.9	30.4	24.7	6.6
IS	81.9	81.5	74.6	49.7	62.6	11.9
NO	67.8	79.2	65.6	50.7	69.8	18.5

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Furthermore, almost every second user, or 44 percent, say they have already at least once compressed a computer file. The only item in the list that only a clear minority say they have carried out is "written a computer programme", with 13 percent of computer users saying so.

With regard to *internet* related activities, items surveyed are not as commonly rooted in the users' experience as the surveyed *computer* related activities. The only item that finds wide agreement is using a search engine, which according to survey respondents' statements almost every internet user (91%) has done at least once already. Ranked second, three in

[6] Data based on the total population can be found in the Annex.

four have sent an e-mail with attachment. The remaining four items each only find a minority of users experienced with it. 32 percent of internet users have posted in forums, chat rooms or the like. 18 percent have used peer-to-peer file exchange, 16 percent have created web pages and 15 percent have used the internet to make telephone calls.

Variations across countries are little. As a general trend, computer users in the New Member States report a little less experience than people in the old EU15. With regard to computer related activities, users from Poland, Latvia and Bulgaria show a smaller number of activities on average while users in Luxemburg, Hungary and Italy report a larger number of activities. With regard to internet related activities, Estonian and Italian users report higher than average numbers of internet activities, while Irish users tend to report fewer internet activities.

Table 4-2 Percent of internet users[7] having carried out different internet related activities (2006)

	used a search engine	sent email with attachment	posted to chat room, newsgroup or forum	used the Internet to make phone calls	used peer-to-peer file sharing	created a web page
EU25	91.2	76.4	31.9	15.3	18.3	15.5
EU15	91.1	77.2	30.2	14.0	17.4	15.6
NewMS	92.0	70.8	42.6	23.3	22.7	15.3
Eurozone	93.1	78.0	31.9	14.5	18.1	15.6
BE	92.3	78.6	27.0	13.8	13.5	11.2
CZ	84.3	80.1	27.6	18.9	7.6	13.0
DK	93.8	84.5	34.8	23.9	17.4	22.8
DE	94.8	75.0	34.8	14.8	10.2	12.1
EE	87.2	84.4	67.8	44.6	33.6	30.9
EL	99.4	63.1	26.3	11.0	15.0	12.7
ES	95.1	68.5	35.1	9.9	31.0	11.5
FR	86.4	80.5	15.7	9.0	:	22.0
IE	90.0	75.7	14.5	10.5	11.6	8.4
IT	94.8	89.4	54.4	24.4	26.9	18.9
CY	79.1	62.6	22.4	14.8	24.3	14.5
LV	92.0	67.6	36.2	24.7	17.0	9.2
LT	97.4	73.3	48.1	34.0	28.2	11.6
LU	95.9	86.5	41.8	24.3	24.2	19.4
HU	98.9	80.7	45.4	21.3	22.9	13.8
NL	95.6	87.1	26.0	16.1	22.8	18.7
AT	92.9	75.8	31.3	17.2	12.3	17.3
PL	91.4	63.2	47.9	25.4	27.3	16.1
PT	93.6	82.3	28.2	19.3	22.4	12.8
SI	95.4	78.2	37.9	13.7	27.4	18.1
SK	96.2	79.2	29.0	14.6	15.5	15.2
FI	92.4	75.2	31.9	21.1	18.6	20.9
SE	87.6	76.3	22.4	11.6	21.8	16.5
UK	82.5	73.1	23.3	11.4	14.0	14.4
BG	89.2	70.2	68.5	37.1	21.5	10.1
IS	93.0	82.0	39.0	29.4	25.8	31.4
NO	91.7	87.2	36.5	25.4	29.0	23.2

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

For all computer related activities it can be observed that they are reported more often by younger computer users than by older users, more often by men than by women and more often by better educated users than by people with lower formal educational attainment. There are significant gender differences with regard to "compressing files", "installing devices" and "writing computer programmes".

[7] Data based on the total population can be found in the Annex.

Table 4-3 Percent of computer users having carried out different computer related activities by socio-demographic characteristics (2006)

	copied or moved a file or folder	used copy or cut and paste	used spreadsheet	compressed files	connected and installed new devices	written a computer programme
EU25 total	80.5	77.8	56.6	43.5	56.9	13.3
Age						
16-24	90.9	89.3	67.2	53.4	66.1	19.3
25-34	86.1	83.3	63.0	52.0	63.8	15.9
35-44	80.7	77.6	56.2	44.6	58.3	12.3
45-54	76.4	73.4	51.8	36.5	50.3	9.3
55-64	68.4	65.7	45.2	29.6	43.8	8.9
65-74	54.7	51.5	30.1	18.4	36.5	6.3
Gender						
female	78.6	76.5	53.4	34.1	43.9	8.2
male	82.2	79.0	59.6	52.6	69.4	18.2
Education						
low	70.9	67.8	43.8	34.4	49.2	8.8
middle	80.3	77.1	56.4	41.0	55.2	12.1
high	90.2	88.9	69.3	56.8	67.4	19.8
Location						
densely populated	81.2	79.0	58.4	46.1	58.7	14.7
intermediate	80.7	77.9	56.1	42.2	56.4	12.5
thinly populated	78.8	75.3	53.4	39.8	53.8	11.4
Employment						
employed or self-employed	82.7	80.1	59.5	46.6	59.7	13.3
unemployed	78.6	75.4	53.0	38.9	55.9	12.0
retired or other inactive	61.8	58.5	35.4	23.1	37.6	7.3
student	94.9	93.2	71.7	57.4	68.9	22.2
Occupation manual						
non-manual	87.2	85.4	66.5	49.9	61.7	14.6
manual	70.2	65.4	41.4	32.8	53.2	7.6
Occupation ICT						
ICT professional	98.6	98.1	92.9	90.3	92.6	60.7
other occupations	82.1	79.5	58.8	43.8	59.0	11.3
Broadband connectivity of household						
Broadband	86.8	84.8	63.6	54.0	66.8	17.0
Narrowband	82.9	80.6	58.4	42.2	60.3	12.2
Frequency of internet use						
at last once/week	91.0	89.0	68.2	55.8	69.5	17.2
less often	68.8	66.5	41.4	23.7	40.7	6.1

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Differences are less significant for type of location and between employed and unemployed users while students report very high experience rates, exceeded only by the category of ICT professionals. Within the group of employed (or self-employed) computer users, however, there are also tremendous differences between manual and non-manual workers.

Almost the same holds true for internet related activities: they also are reported more often by younger computer users than by older users and more often by men than by women. Better educated users report higher usage of four out of six items than do people with lower formal educational attainment, the exceptions being the items peer-to-peer file sharing and posting messages in chats, forums or on other web pages. The most prominent gender difference occurs also with regard to peer-to-peer file sharing.

Differences are also again less significant for type of location and between employed and unemployed users (the former being just somewhat more experienced with e-mail attachments, the latter with posting messages) while again students report very high experience rates. ICT professionals generally report the highest experience rates. Among

employed computer users differences between manual and non-manual workers are not as marked as for computer related activities.

Table 4-4 Percent of internet users having carried out different internet related activities by socio-demographic characteristics (2006)

	used a search engine	sent email with attachment	posted to chat room, newsgroup or forum	used the Internet to make phone calls	used peer-to-peer file sharing	created a web page
EU25 total	91.2	76.4	31.9	15.3	18.3	15.5
Age						
16-24	93.9	79.9	55.9	19.1	35.5	24.1
25-34	93.4	81.0	38.1	19.3	22.6	17.1
35-44	92.4	76.6	24.9	14.0	13.2	13.4
45-54	89.5	72.8	17.9	11.4	8.7	10.7
55-64	85.6	69.4	12.3	10.0	5.5	9.1
65-74	77.9	59.4	8.7	8.7	2.8	6.7
Gender						
female	89.9	74.9	28.1	11.8	12.4	11.1
male	92.5	77.7	35.4	18.6	23.7	19.6
Education						
low	86.3	67.0	33.8	12.8	21.1	15.5
middle	91.0	74.6	32.2	15.0	17.2	13.2
high	95.7	86.8	29.8	17.8	18.1	19.1
Location						
densely populated	91.3	78.7	33.1	16.6	19.3	16.3
intermediate	91.5	75.8	32.8	15.3	17.5	14.5
thinly populated	90.8	72.1	28.3	12.6	16.9	15.0
Employment						
employed or self-employed	92.0	78.1	28.6	14.9	16.6	14.4
unemployed	90.4	69.0	36.6	14.8	20.0	16.6
retired or other inactive	82.3	61.6	17.9	10.7	7.4	8.7
student	96.5	85.3	60.1	22.1	38.1	27.5
Occupation manual						
non-manual	93.3	83.9	28.7	16.3	15.4	16.3
manual	86.8	63.9	26.8	12.4	14.7	9.5
Occupation ICT						
ICT professional	99.1	97.3	59.7	41.5	38.3	54.5
other occupations	91.6	78.4	27.2	14.3	14.6	13.3
Broadband connectivity of household						
Broadband	94.7	84.4	37.4	21.2	23.9	19.3
Narrowband	91.9	75.8	28.1	10.4	12.2	12.0
Frequency of internet use						
at last once/week	95.9	85.3	38.9	19.1	21.3	17.2
less often	83.5	42.8	16.8	5.5	6.8	4.2

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

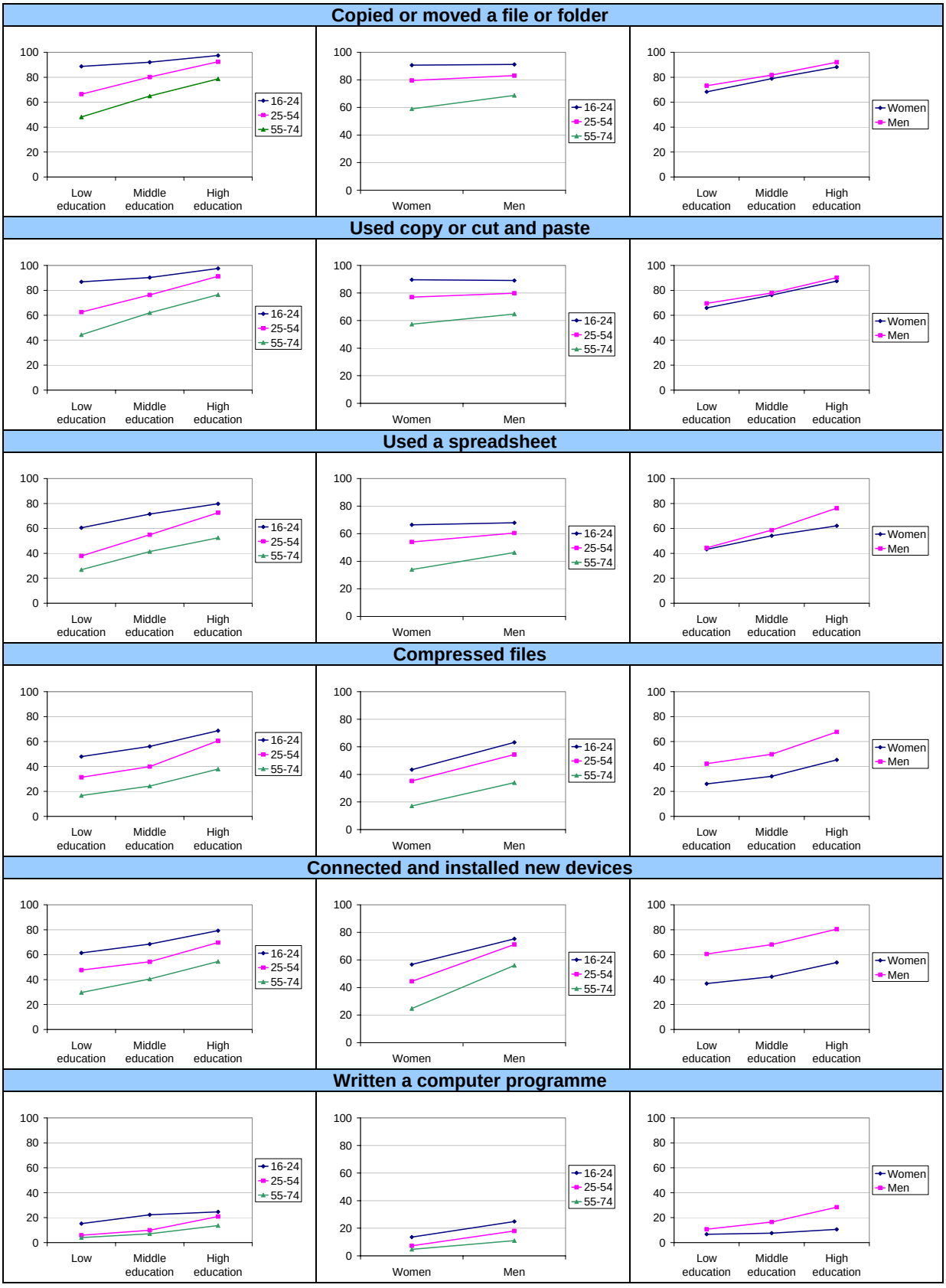
4.2 Interaction of Socio-Demographics and e-Skills Levels

Interactions between the three independent variables gender, education and age and the skills variables show hardly any surprises (see figures below). Generally speaking, there is a broader range of skills levels between age brackets for women than for men. Gender differences disappear in the younger cohorts for the first three items, while there are gender differences even in the youngest group with regard to compressing files and connecting and installing new devices. These two items have the largest gender gap irrespective of cohorts and education groups.

With regard to posting messages to chat rooms, newsgroups or forums, an interesting interrelation exists between age and education. In the youngest age bracket, posting is more likely to be found among lower educated than among higher educated internet users, while there is a vice-versa relation in the middle and older age bracket. This may also reflect a higher share of women among the higher educated in the youngest age group, for women are significantly less likely to engage in message posting than men[8].

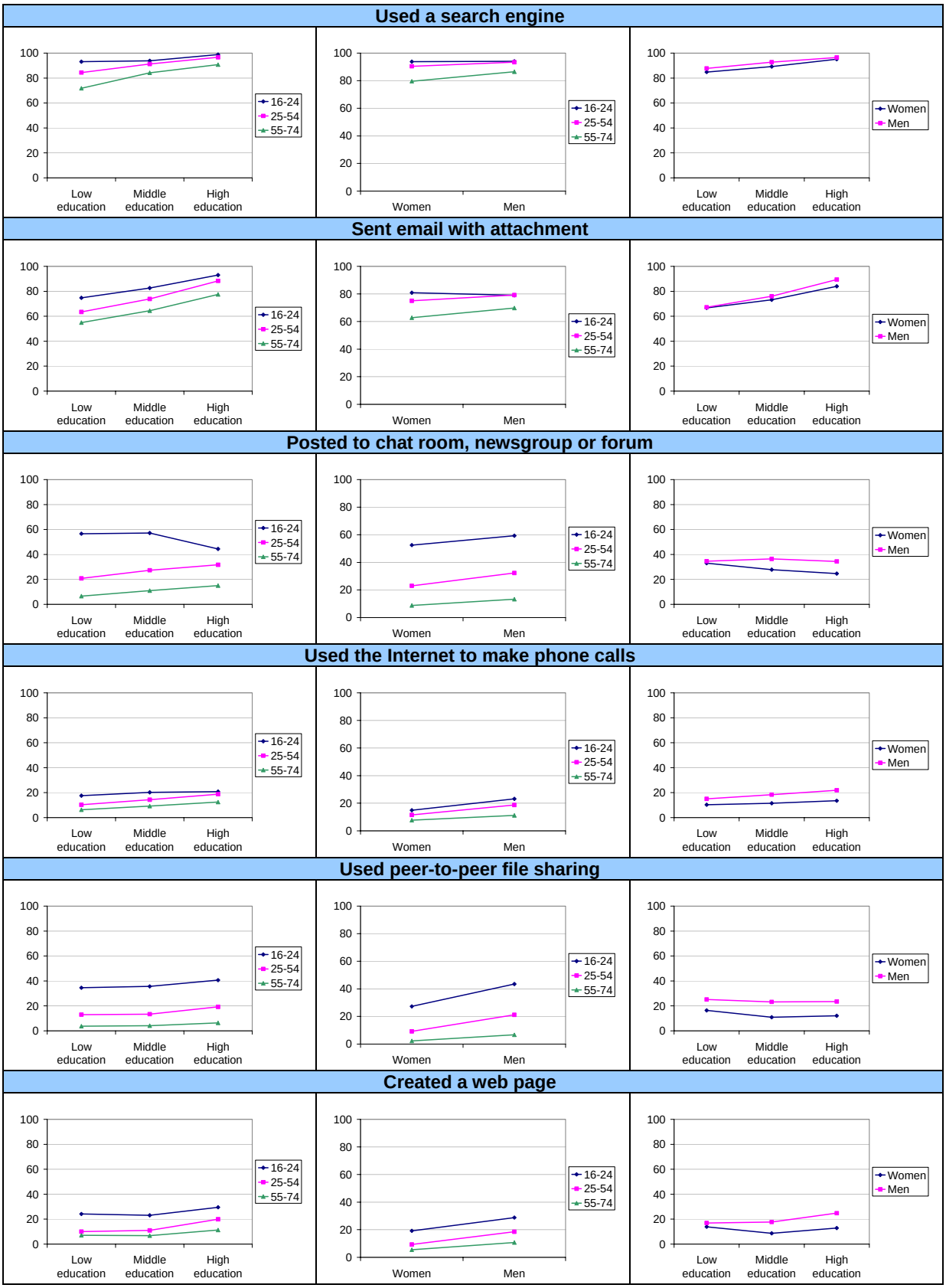
[8] Data tables containing the data underlying the exhibits on the following pages can be found in the Annex.

Figure 4-1 Variable interactions: Computer users having carried out different computer related activities by socio-demographic characteristics (2006)



Source: Eurostat 2006 Community ICT Household survey

Figure 4-2 Variable interactions: Internet users having carried out different internet related activities by socio-demographic characteristics (2006)



Source: Eurostat 2006 Community ICT Household survey

4.3 Excursus: Broadband home access and interactions with other demographic variables, and e-skills

To recap results already mentioned above (see table below), users living in broadband households are more likely to have carried out the different computer related activities that make up the ICT skills measurement.

Table 4-5 Percent of computer/internet users having carried out different computer/internet related activities by socio-demographic characteristics (2006)

	copied or moved a file or folder	used copy or cut and paste	used spreadsheet	compressed files	connected and installed new devices	written a computer programme
EU25 total	80.5	77.8	56.6	43.5	56.9	13.3
Broadband connectivity of household						
Broadband	86.8	84.8	63.6	54.0	66.8	17.0
Narrowband	82.9	80.6	58.4	42.2	60.3	12.2

	used a search engine	sent email with attachment	posted to chat room, newsgroup or forum	used the Internet to make phone calls	used peer-to-peer file sharing	created a web page
EU25 total	91.2	76.4	31.9	15.3	18.3	15.5
Broadband connectivity of household						
Broadband	94.7	84.4	37.4	21.2	23.9	19.3
Narrowband	91.9	75.8	28.1	10.4	12.2	12.0

Source: Eurostat 2006 Community ICT Household survey

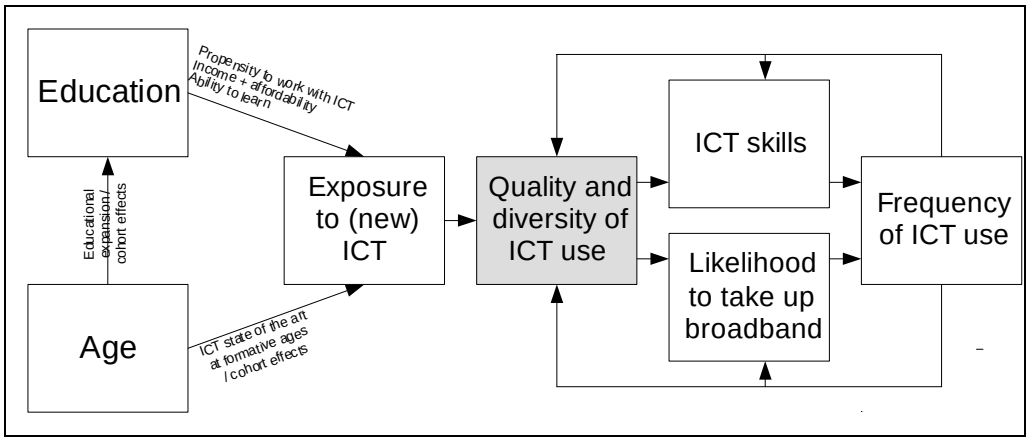
Bandwidth intensive activities such as sending e-mail attachments, internet telephony and peer-to-peer file sharing are cumbersome to use when only narrowband connections are available and are therefore naturally carried out more often by broadband home dwellers.

It turns out, however, that there is also a statistical association between living in a broadband household and basic computer skills that are not related to *connected* computers – such as copying files, using spreadsheet software and so on. It may be assumed that the effect here comes from the enhanced likelihood of advanced users to migrate to broadband. Or, conversely, the enhanced likelihood of users who (have to) rely on narrowband connectivity to withdraw from more intense computer use because of the tedious experience of lacking connection speed.

The question that arises from this is whether the differences in skills between broadband and narrowband users can be attributed either to the differences that exist between them with regard to socio-economic attributes, or whether skills differences related to bandwidth are chiefly the result of the overall intensity of ICT use, which simultaneously influences skills and the decision to take up broadband.

The reasoning is displayed in the figure below, which covers the observed variables for which breakdown data are available: age, education, frequency or ICT use and home broadband. ICT skills and quality and diversity of ICT use are conceptually distinct, but the latter is used as an indicator of the former in the Eurostat framework.

Figure 4-3 Assumptions about the causal relations of broadband, socio-demographics, frequency of use and ICT skills



The empirical picture as presented in figure 4-4 below[9] now suggests that the usage difference between narrowband household and broadband household dwellers is rather constant for the two categories age and education (that is, the curves move more or less in parallel).

With regard to frequency of use, however (if, admitted, measured crude, i.e. differentiated only as "more than once a week" vs. "less than week"), the curves lose most of their distance. Regular users are almost equally as likely to be using the different services, whether they live in a broadband or in a narrowband household.

Hence, the crucial point which is most probably behind the usage difference between broadband and narrowband users is that broadband users are generally more frequently using the internet. This frequency of use difference then seems to translate into differences of the quality and diversity of use – which is defining the level of ICT skills.

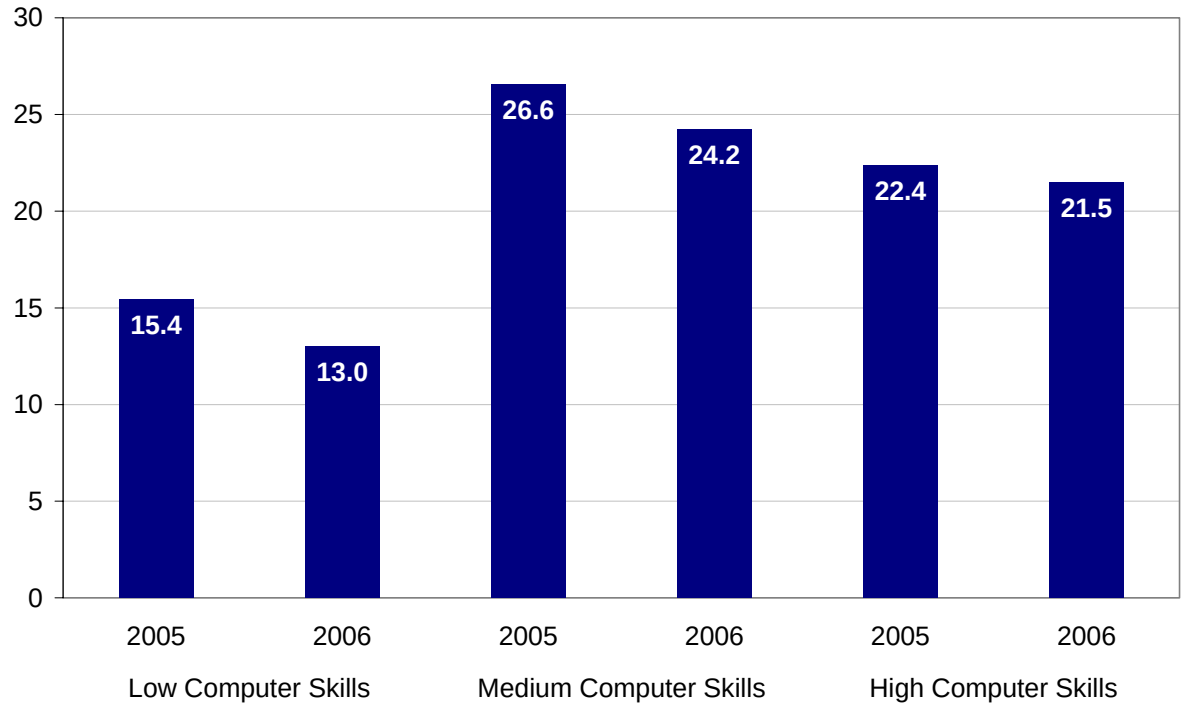
[9] Because the ICT skills items data were not available in the required breakdowns, the questions used were, in accordance with the client of this study, the indicators on e-commerce (E1), e-government (D4a-c), and the grouped results of question C7: communication (a,b,c), information search and services (d-l), selling or banking (m,n) and training and education (o,p,q).

Figure 4-4 Variable interactions: Internet users having carried out different internet related activities by socio-demographic characteristics (2006)

4.4 Compound Indicators Measuring e-Skills Levels

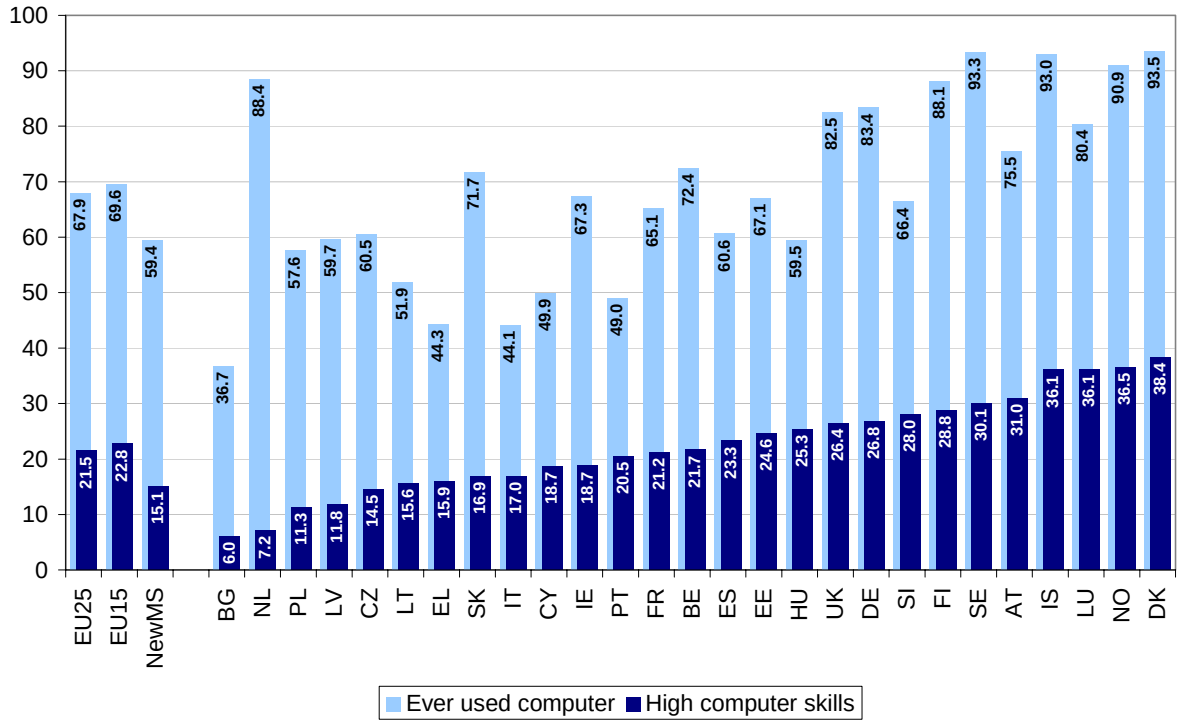
As described in chapter 3.3, compound indicators have been provided by Eurostat which count the numbers of activities that users report. This way, a very simple index reveals the proportion of people with the respective number of stated activities, and refers to these levels as "no computer (internet) skills" (no item mentioned), "low computer (internet) skills" (1-2 items mentioned), "medium computer (internet) skills" (3-4 items mentioned), or "high computer (internet) skills" (5-6 items mentioned).

Figure 4-5 Percent of population with different levels of computer skills in EU25 2005-2006



Denmark has the highest population share of people with so-defined high computer skills, namely 38 percent. In three other countries more than one third of the population are found highly skilled: Norway, Luxemburg and Iceland.

Figure 4-6 Percent of population having high computer skills compared to general computer usage (2006)[10]



Source: Eurostat 2006 Community ICT Household survey

The compound indicator data on computer skills has been gathered since 2005. Comparing the data for the two years 2005 and 2006, it becomes obvious, that the overall level of computer skills has declined in Europe, and in most countries.

The country level movements give reason to assume that there are mostly some methodological issues behind the changes. The most striking downturn has occurred in the Netherlands, where 33 percent of the population were found to have high computer skills in 2005, but only 7 percent in 2006. This can not reasonably be explained by real developments, but must have some underlying measurement issues. Vice versa, in Finland there has been the most tremendous increase: from 13 percent high skilled in 2005 to 29 percent in 2006. Developments in other countries are more likely to reflect real world phenomena. Very high still are increases in Greece, Hungary and Germany, while Iceland, Luxembourg and the UK show the largest decrease in the share of people with high computer skills.

[10] Although the level of skills was only asked of computer users (internet users in the next exhibit, respectively), the data is here reported as share of the total population. This kind of displaying the data is supposed to provide information about the society level spread of advanced computer skills. If one is interested in the diffusion of skills among computer/internet users, the data can be related to the data referring to "ever used computer/internet" which is therefore included in the exhibit.

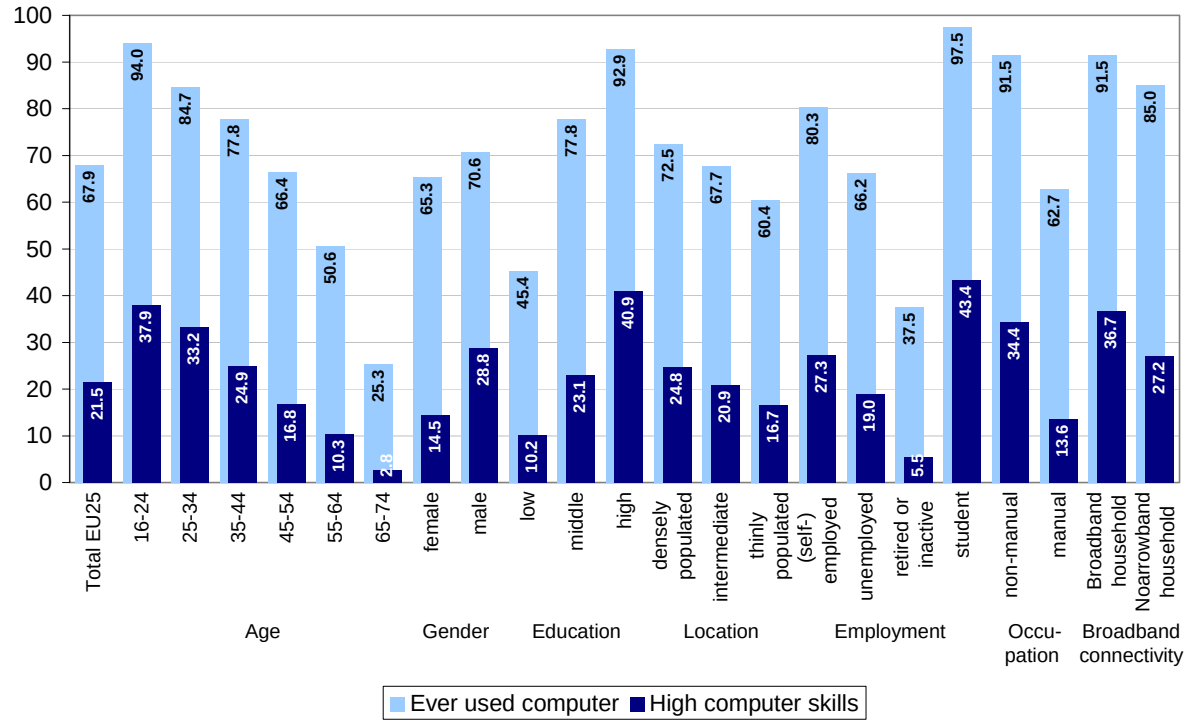
Table 4-6 Percent of population with different levels of computer skills, 2005-2006

	Low Computer Skills		Medium Computer Skills		High Computer Skills	
	2005	2006	2005	2006	2005	2006
EU25	15.4	13.0	26.6	24.2	22.4	21.5
EU15	15.3	12.6	27.7	25.0	24.1	22.8
NewMS	15.9	15.0	22.2	20.2	15.3	15.1
Eurozone	15.1	12.5	26.7	24.4	21.4	21.7
BE	:	14.7	:	23.2	:	21.7
CZ	:	15.6	:	21.8	:	14.5
DK	13.4	13.8	37.4	31.5	39.2	38.4
DE	23.2	17.2	33.8	31.4	22.2	26.8
EE	15.6	9.5	18.4	17.9	28.5	24.6
EL	11.8	13.6	14.3	13.7	9.0	15.9
ES	:	10.4	:	20.4	:	23.3
FR	:	10.2	:	23.4	:	21.2
IE	:	13.2	:	9.7	:	18.7
IT	4.9	7.5	17.5	16.8	18.8	17.0
CY	9.5	9.1	21.7	17.9	14.5	18.7
LV	20.4	15.9	24.0	20.2	11.4	11.8
LT	9.8	11.4	18.9	19.6	18.5	15.6
LU	12.8	11.3	25.4	25.5	41.9	36.1
HU	6.9	10.0	16.3	21.0	19.5	25.3
NL	17.3	21.2	35.8	47.8	32.9	7.2
AT	12.3	11.8	26.3	24.4	30.7	31.0
PL	18.7	16.5	22.4	18.4	12.5	11.3
PT	9.0	8.1	15.8	13.6	21.4	20.5
SI	11.6	10.3	21.9	19.6	27.2	28.0
SK	16.9	18.0	35.0	29.6	19.2	16.9
FI	17.0	15.2	37.0	29.1	13.2	28.8
SE	20.0	17.7	36.9	33.0	32.0	30.1
UK	15.7	12.5	28.7	27.0	30.8	26.4
BG	:	11.2	:	13.2	:	6.0
IS	10.8	13.4	33.2	35.2	41.9	36.1
NO	23.4	16.5	31.8	27.6	34.7	36.5

Source: Eurostat 2006 Community ICT Household survey (:) Data not available no data for MT, RO

With regard to socio-demographic differences in the level of computer skills the patterns observed for the single items remain stable: The younger, better educated, male, urban, white collar, employed (if not students) respondents show the highest shares of users who have carried out five or all six computer related activities. While differences between groups are substantial in all of these categories, the most apparent between-group-differences appear in education and with regard to gender.

Figure 4-7 Percent of population by socio-demographics having high computer skills compared to general computer usage (2006)



Source: Eurostat 2006 Community ICT Household survey

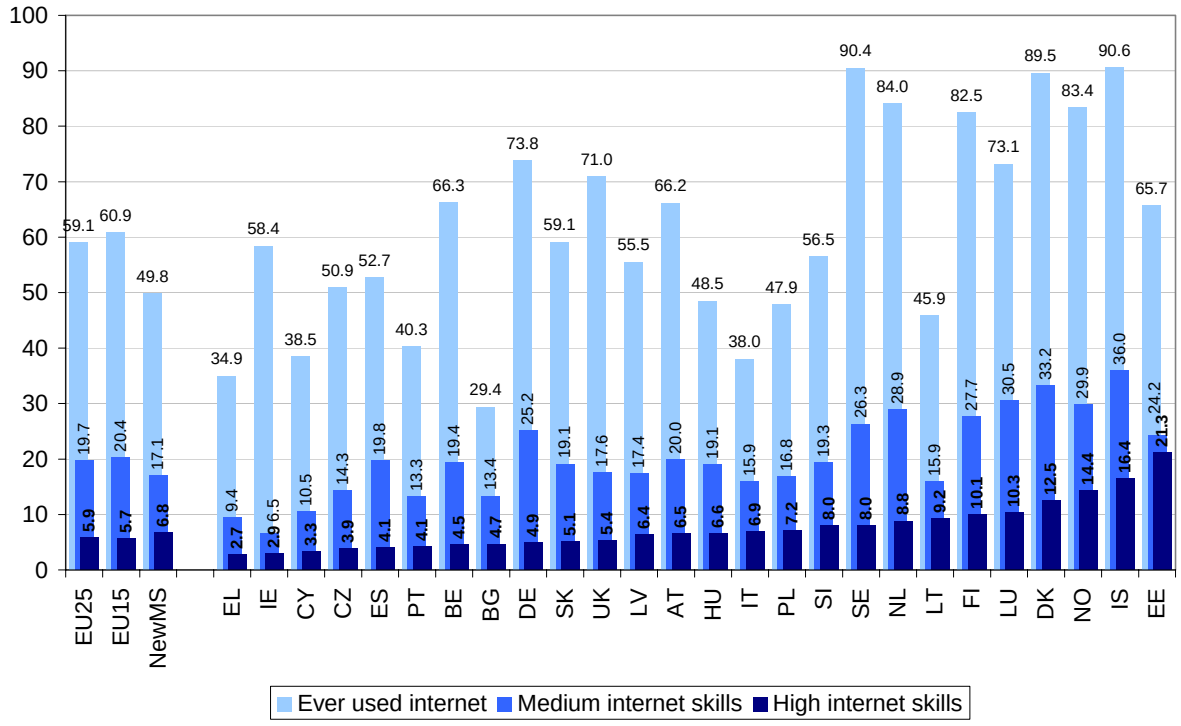
The surveyed *Internet* activity items are generally reported by respondents less often, hence the level of what has been dubbed high level of internet skills is much lower for internet than for computer skills. Here, Estonia has the highest share of high skilled population, with 22 percent. Iceland, Norway, Denmark Luxembourg and Finland follow with 10 percent or more of the population being "high skilled". The remaining 20 countries all have less than one in ten citizens who has the so-defined high internet skills.

Because of the low overall levels of "high" skills, the following exhibits display both high and medium skills levels. Added up, the figures are comparable to the computer skills index and variations across countries and socio-demographic groups can be compared.

Viewed this way, country differences show a larger spread for internet related activities than for computer activities. Forerunner countries' skills levels in Iceland, Denmark, Estonia, Norway, Luxembourg, Finland and the Netherlands are quite distant from the levels in Ireland (conspicuously), Greece and Cyprus. For computer related activities, there is also a significant range of levels, but frontrunners Denmark, Norway, Luxembourg and Iceland are not as far from laggard countries Bulgaria, Netherlands (surprisingly), Poland and Latvia.

The educational differences are smaller for internet items than those observed with computer related activities. The same holds true for gender differences. Age differences are somewhat larger, with the younger two cohorts being somewhat more dissimilar from older cohorts with regard to internet than to computer related activities.

Figure 4-8 Percent of population having high or medium internet skills compared to general internet usage (2006)



Source: Eurostat 2006 Community ICT Household survey

As for the data on computer skills, the compound indicator on internet skills can be compared to previous year (2005) results. Comparing the data for the two years 2005 and 2006, and unlike the computer skills results, the overall level of internet skills has increased in Europe, and in almost all countries.

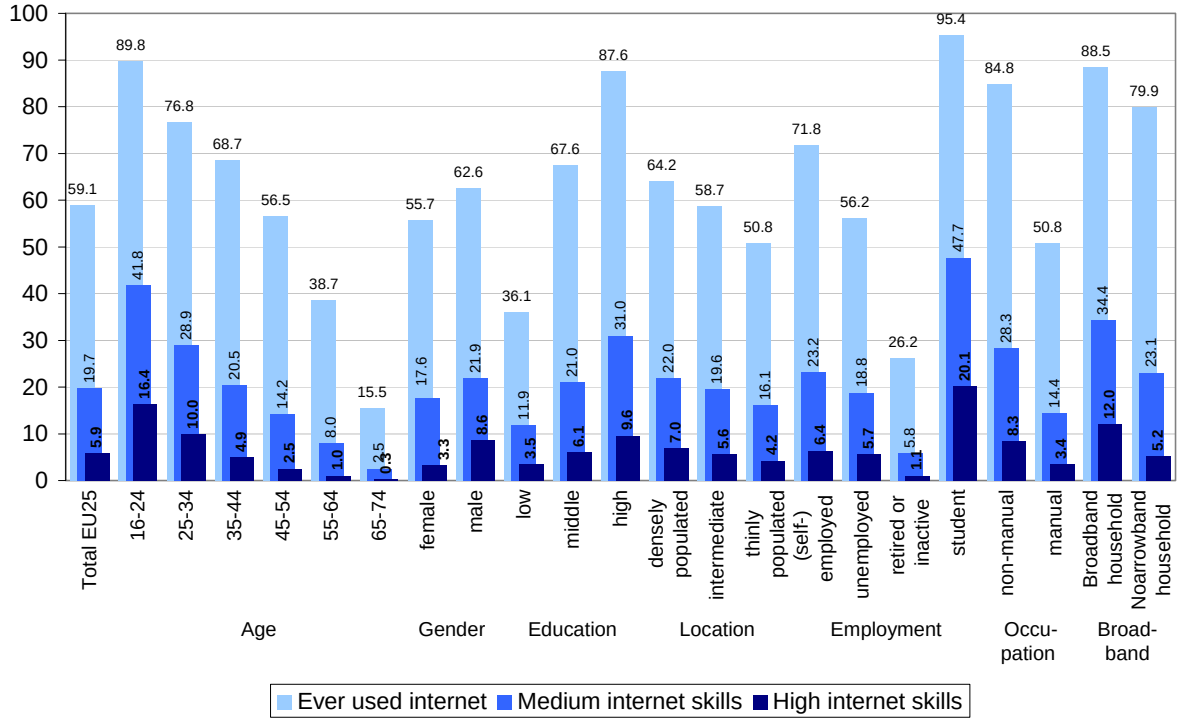
The increase has been higher on average in the New Member States (plus 2.4 percentage points on “high skills”). The highest increases (in terms of percentage points difference) can be found in Sweden (plus 6.6 percentage points on “high skills”), Denmark (plus 5.2 percentage points) and Lithuania (plus 4.8 percentage points). The share of high skills has only been decreasing in the UK (-1.2 percentage points)

Table 4-7 Percent of population with different levels of internet skills in 2005-2006

	Low Internet Skills		Medium Internet Skills		High Internet Skills	
	2005	2006	2005	2006	2005	2006
EU25	31.4	31.1	17.5	19.7	4.8	5.9
EU15	33.5	32.7	18.1	20.4	4.8	5.7
NewMS	23.0	24.3	15.0	17.1	4.4	6.8
Eurozone	30.8	30.8	17.2	20.5	4.4	5.5
BE	:	38.7	:	19.4	:	4.5
CZ	:	29.9	:	14.3	:	3.9
DK	47.1	40.1	27.0	33.2	7.3	12.5
DE	40.6	41.3	19.6	25.2	3.9	4.9
EE	17.8	17.3	21.2	24.2	20.1	21.3
EL	20.5	22.6	5.2	9.4	0.9	2.7
ES	:	27.4	:	19.8	:	4.1
IE	36.5	42.2	5.0	6.5	0.8	2.9
IT	14.0	14.5	15.1	15.9	5.7	6.9
CY	20.0	20.1	8.6	10.5	2.4	3.3
LV	27.5	28.6	15.5	17.4	3.2	6.4
LT	20.1	19.7	13.3	15.9	4.4	9.2
LU	33.7	31.2	28.0	30.5	8.8	10.3
HU	18.6	22.6	16.3	19.1	3.3	6.6
NL	49.1	43.9	24.9	28.9	5.5	8.8
AT	38.3	36.1	15.6	20.0	2.9	6.5
PL	21.8	22.2	14.5	16.8	4.5	7.2
PT	20.1	21.8	12.5	13.3	4.1	4.1
SI	29.7	27.1	16.8	19.3	:	8.0
SK	39.2	34.0	15.5	19.1	2.6	5.1
FI	37.1	39.5	25.4	27.7	7.7	10.1
SE	51.7	47.6	13.6	26.3	1.4	8.0
UK	:	37.8	:	17.6	6.6	5.4
BG	:	10.1	:	13.4	:	4.7
IS	37.2	34.5	32.5	36.0	13.3	16.4
NO	39.4	35.4	28.0	29.9	9.4	14.4

Source: Eurostat 2006 Community ICT Household survey (:) Data not available, no data for FR, MT, RO

Figure 4-9 Percent of population by socio-demographics having high or medium internet skills compared to general internet usage (2006)



Source: Eurostat 2006 Community ICT Household survey

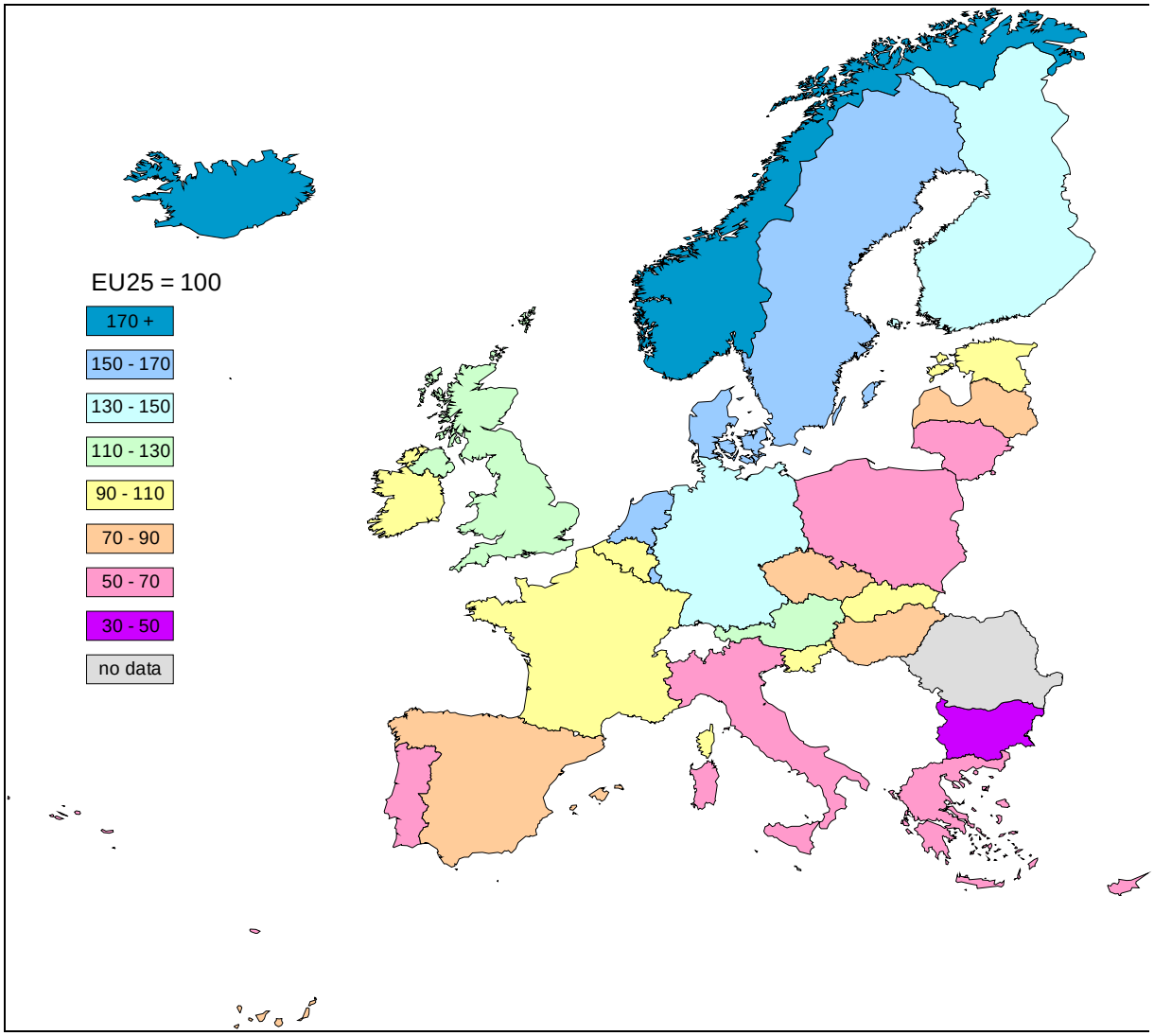
The share of highly skilled users is also considerably higher in broadband households than in narrowband households. 37 percent of broadband household dwellers have high computer skills and 12 have high internet skills, compared to 27 percent and 5.2 percent in narrowband households and 22 percent and 5.9 percent in all households.

4.5 Aggregate level compound indicator of e-skills

To compare the overall skills supply levels in Member States, it is possible to generate an aggregate index based on the survey results of the internet and computer skills questions. In accordance with the client, an additional dimension of the ICT skills index shall cover internet based interaction with government and the use of the internet for e-commerce. The rationale behind it is to provide information about the overall societal level of ICT skills.

The index is hence based of three equally weighted sub-indices: computer skills, internet skills and internet interactions. The index has a natural range of 0 (no skills) – 100 (perfect skills, i.e. all items positive).

Figure 4-10 ICT skills in Europe (2006)



Source: The author's calculation based on Eurostat 2006 Community ICT Household survey. No data for MT, RO

The highest skills according to this index can be found in all Nordic countries, the Netherlands, Luxembourg and Germany. The three sub-indices are all highly correlated on country level, r= 0.87 being the lowest figure (between internet skills and internet interaction).

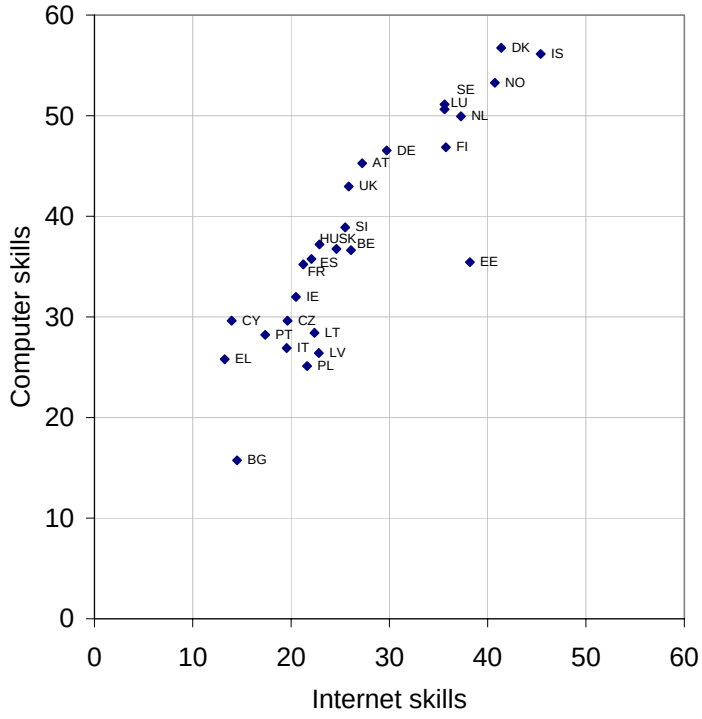
Table 4-8 ICT skills index (2006)

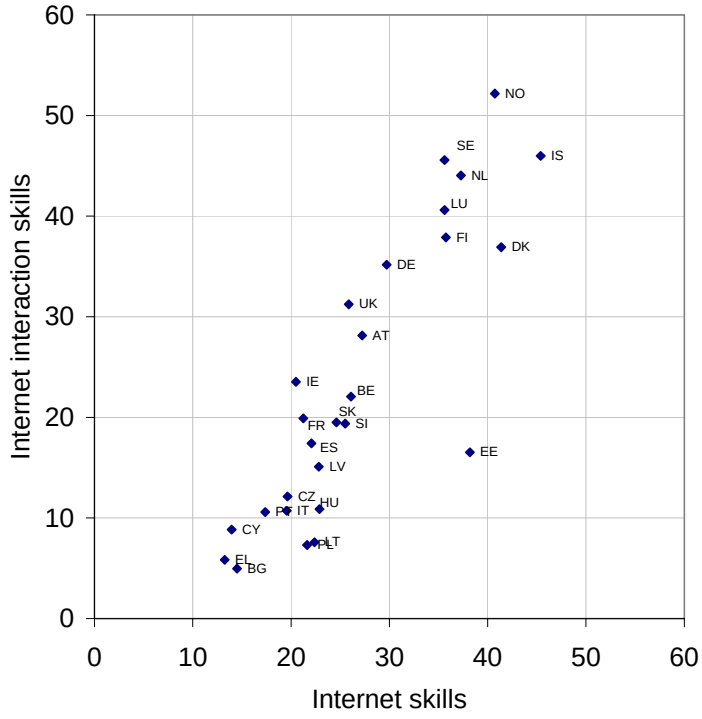
	Computer skills index (Average of 6 items)	Internet skills index (Average of 6 items)	Internet interaction index (Average of 2 items)	ICT skills index (average of three sub indices)	*EU25= 100*
EU25	37.2	24.5	22.3	28.0	*100.0*
EU15	38.8	24.9	24.9	29.5	*105.5*
NewMS	29.0	22.1	10.1	20.4	*73.0*
Eurozone	37.4	24.2	23.5	28.4	*101.4*
BE	36.6	26.1	22.1	28.3	*101.0*
CZ	29.6	19.6	12.1	20.5	*73.1*
DK	56.7	41.4	36.9	45.0	*160.8*
DE	46.5	29.7	35.2	37.1	*132.7*
EE	35.4	38.2	16.5	30.0	*107.4*
EL	25.8	13.3	5.8	15.0	*53.5*
ES	35.8	22.1	17.4	25.1	*89.6*
FR	35.2	21.2	19.9	25.5	*91.0*
IE	32.0	20.5	23.5	25.3	*90.5*
IT	26.9	19.6	10.7	19.1	*68.1*
CY	29.6	14.0	8.8	17.5	*62.5*
LV	26.4	22.8	15.1	21.4	*76.6*
LT	28.4	22.4	7.6	19.5	*69.5*
LU	50.6	35.6	40.6	42.3	*151.1*
HU	37.2	22.9	10.9	23.7	*84.6*
NL	49.9	37.3	44.0	43.8	*156.4*
AT	45.3	27.2	28.1	33.5	*119.9*
PL	25.1	21.6	7.3	18.0	*64.4*
PT	28.2	17.4	10.6	18.7	*66.9*
SI	38.9	25.5	19.4	27.9	*99.8*
SK	36.8	24.6	19.5	27.0	*96.3*
FI	46.9	35.7	37.9	40.2	*143.5*
SE	51.1	35.6	45.6	44.1	*157.6*
UK	43.0	25.9	31.2	33.3	*119.2*
BG	15.7	14.5	5.0	11.7	*42.0*
IS	56.1	45.4	46.0	49.2	*175.7*
NO	53.3	40.7	52.2	48.7	174.1

Source: The author's calculation based on Eurostat 2006 Community ICT Household survey. No data for MT, RO

The high correlation between the sub-indices can be seen from the following graphs:

Figure 4-11 Correlation of sub-indices of ICT skills index(2006)





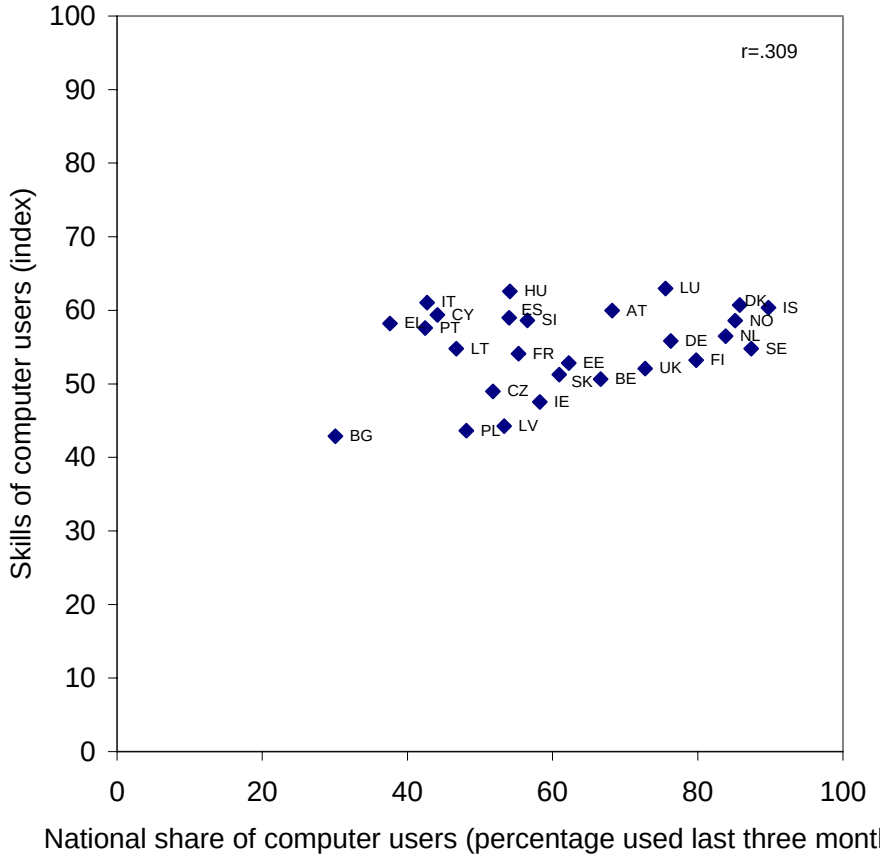
Source: The author's calculation based on Eurostat 2006 Community ICT Household survey. No data for MT, RO

The fact that there exists a correlation between a country's level of ICT use and ICT skills is trivial and to some degree tautological, for the questions about ICT skills can only reasonably be asked to ICT users. It is however interesting to see, whether the overall level of ICT use, the maturity of the country so to say, has any influence on the actual skills level of users. Theoretically such an effect can be expected for instance because countries with a higher share of users can be assumed to have a higher share of long term users. On the other hand, countries with fewer users tend to have a higher share of highly committed, well educated early adopters which would have the contrary effect.

Furthermore, context effects could be in place. These could consist of network externalities, that is, positive externalities from the higher likelihood that people an internet user interacts with are also users, which could reinforce user skills.

Finally, countries with higher shares of users tend to offer a better infrastructure and opportunities to attain eSkills. For instance, e-government offers may be better, more content or commercial offerings may be available online.

Figure 4-12 Correlation of ICT skills index (of users only) and the national shares of computer users (2006)



Empirically, the assumed correlation exists, but at a rather low level. The absolute range of values is much lower if one analyses users only. High skills levels among users occur in countries of a low overall ICT use level, such as Italy or Cyprus as well as in countries of higher use levels such as Denmark and Luxembourg. In countries with higher overall usage levels, however, also the skills level of users tends to be high rather than low. Consequently, the correlation is rather low, given the limited number of observations (r=0.309).

4.6 Computer Course Participation

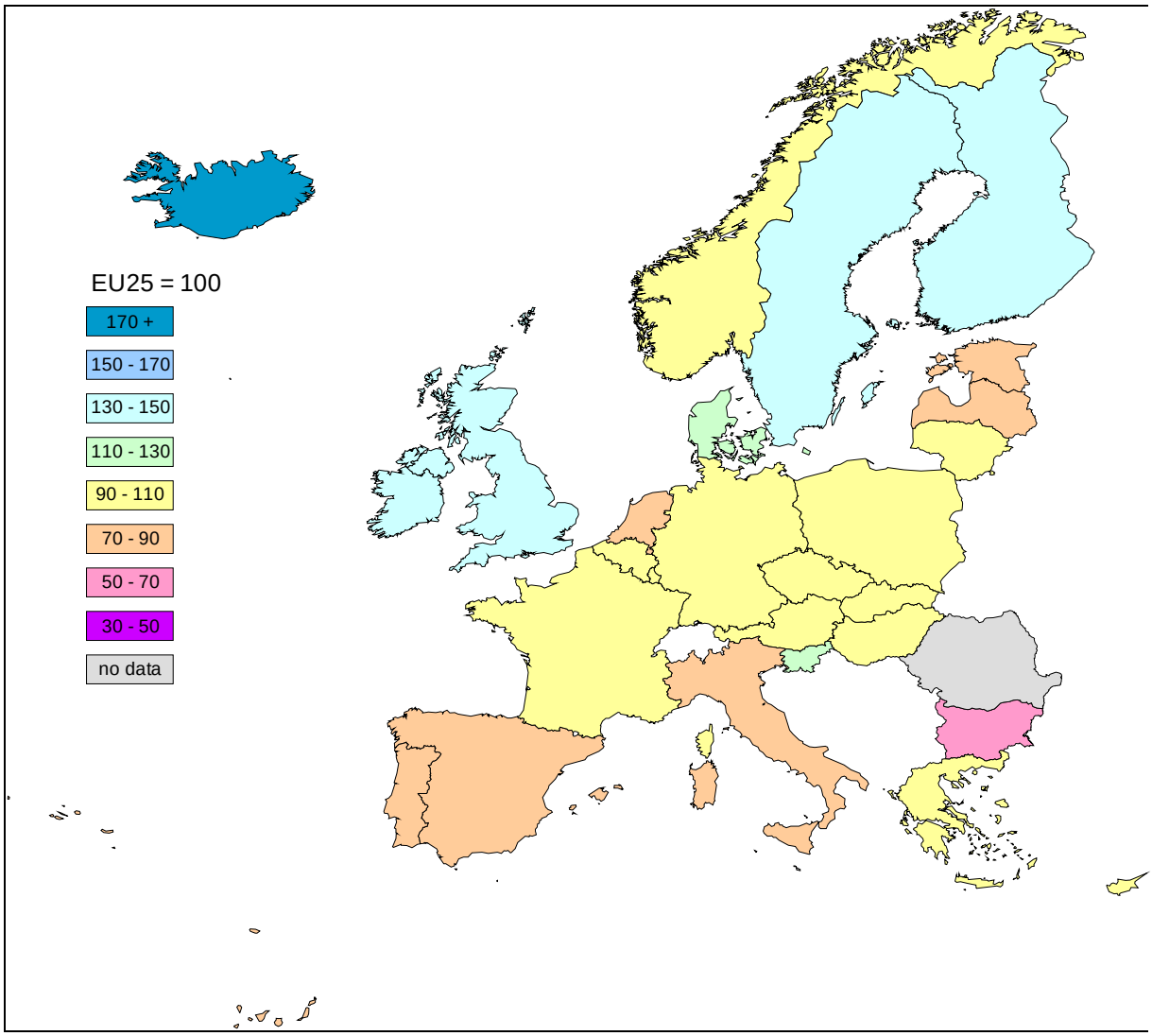
Participation in computer related learning courses is surveyed through a question that enquires when the last participation in such a course occurred. One may assume a notion that a "recent" participation can cover any time during the three years preceding the survey. The following exhibit displays the distribution of computer learners in the participating countries. The Nordic countries, Iceland, Finland and Sweden in particular, as leaders of the ranking, but also Denmark and Norway have well above EU average computer learning participation rates. In between them also the UK, Ireland and Slovenia are found.

Table 4-9 Percent of population having taken a computer course by time elapsed since in 2005-2006

	Taken computer course more than 3 years ago		Taken computer course between 1 and 3 years ago		Taken computer course in last 12 months	
	2005	2006	2005	2006	2005	2006
EU25	19.6	22.1	11.7	11.1	9.9	10.4
EU15	21.9	23.8	12.6	11.6	9.3	10.0
NewMS	12.2	15.0	8.0	8.2	12.2	12.2
Eurozone	:	22.5	12.0	11.2	7.5	8.8
BE	:	19.5	:	8.8	:	11.7
CZ	12.9	17.8	8.4	10.1	12.2	12.0
DK	32.4	36.1	14.1	13.1	10.9	10.7
DE	24.2	27.8	13.1	12.5	8.4	10.0
EE	29.7	22.4	8.5	8.1	14.8	7.1
EL	10.1	9.7	6.7	7.6	7.3	13.0
ES	14.3	15.7	10.2	8.7	8.1	7.3
FR	:	22.5	:	10.0	:	10.6
IE	16.1	19.3	11.8	12.7	10.3	15.2
IT	:	:	14.1	14.5	3.9	4.0
CY	13.4	16.7	9.1	7.3	12.4	14.8
LV	14.9	18.7	11.5	8.1	9.7	9.4
LT	9.7	14.3	7.2	7.8	13.2	13.6
LU	21.4	22.6	9.8	10.7	12.6	11.8
HU	10.2	20.7	8.8	10.1	11.0	11.5
NL	28.2	29.5	10.2	8.5	9.4	8.4
AT	18.0	24.8	9.0	9.4	8.3	10.0
PL	11.1	12.2	7.4	6.9	12.6	12.6
PT	9.5	10.1	7.4	7.0	8.2	8.1
SI	16.5	16.0	9.7	10.2	12.2	16.8
SK	16.3	15.1	8.6	9.4	11.1	10.7
FI	25.4	29.7	17.8	17.3	16.6	14.5
SE	37.1	39.9	15.8	15.5	16.9	15.3
UK	24.7	26.2	14.7	13.5	15.8	16.0
BG	:	9.9	:	5.7	:	5.3
IS	22.9	33.8	16.9	20.6	12.8	15.9
NO	26.5	26.7	13.5	12.5	12.0	10.3

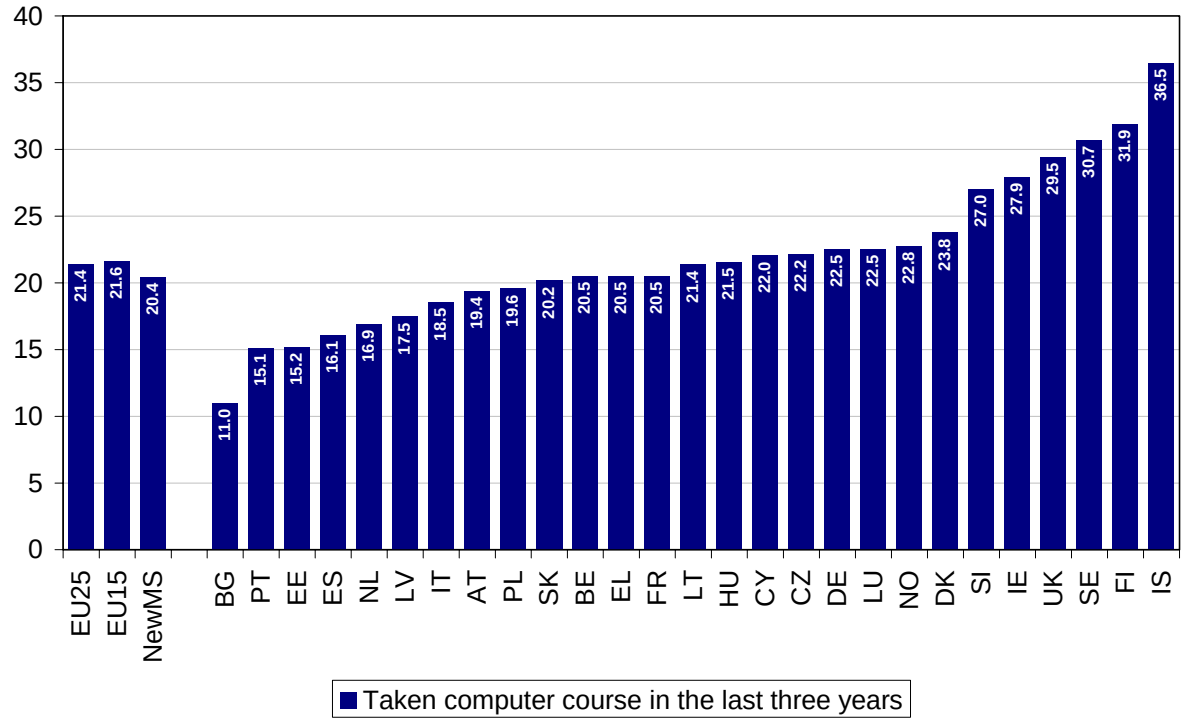
Source: Eurostat 2006 Community ICT Household survey (:) Data not available, no data for MT, RO

Figure 4-13 Percent of population having taken part in a training course on any aspect of computer use during the last three years, EU25 = 100 (2006)



Source: Eurostat 2006 Community ICT Household survey

Figure 4-14 Percent of population having taken part in a training course on any aspect of computer use during the last three years (2006)



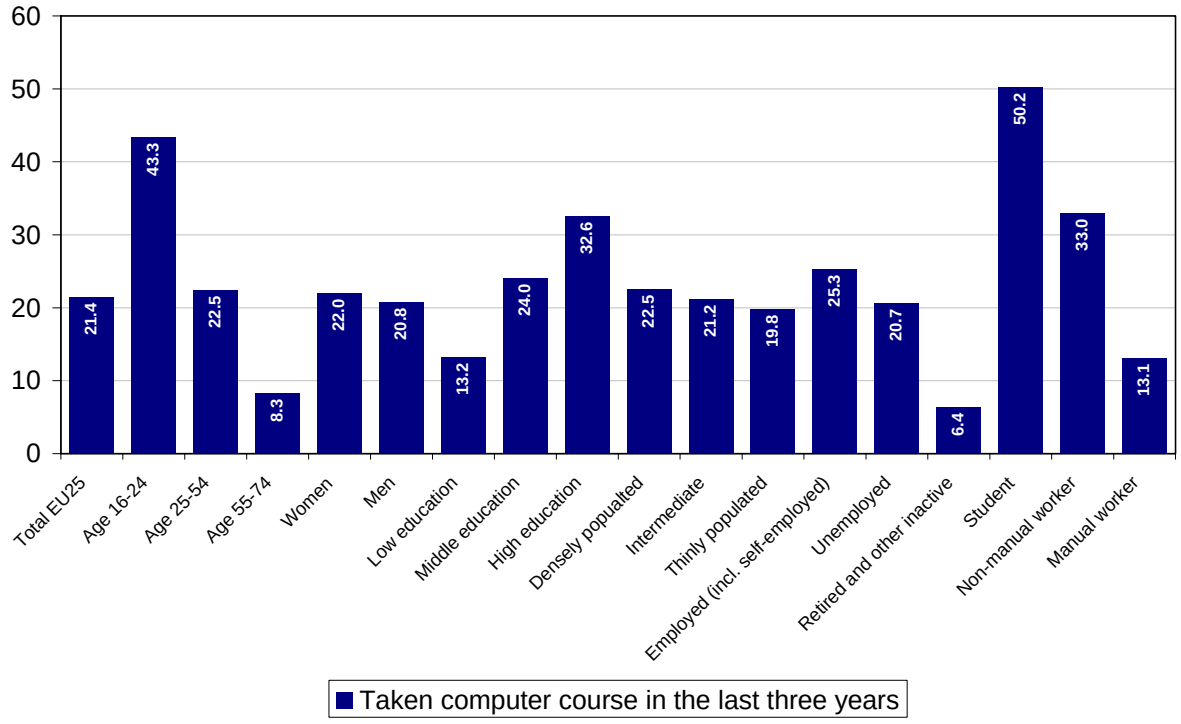
Source: Eurostat 2006 Community ICT Household survey

Ratios of participation in the last three years which are below 20% can be found in Bulgaria, Portugal, Estonia, Spain, the Netherlands, Latvia, Lithuania, Italy, Austria and Poland.

Students (50%), young people (age 16-24: 43%), non-manual workers (33%) and highly educated persons (33%) are most likely to be participating in computer courses. On the other hand, retired or inactive people (6%), people aged 55-74 (8%) and manual workers and people with low educational attainment levels (each 13%) are least likely.

Unemployed persons (21%) are somewhat less likely than those working (as employed and self-employed).

Figure 4-15 Percent of population having taken part in a training course on any aspect of computer use during the last three years (2006)



Source: Eurostat 2006 Community ICT Household survey

It may be interesting to have a closer look at the difference in computer course participation between employed and unemployed people across countries. There are 17 countries that provide data for both groups. Among these, in Greece and Austria, unemployed persons have a higher participation rate in computer courses than employed persons. In six other countries the participation rate of unemployed persons is at about 90 percent of the rate of employed persons: Poland, Belgium, UK, Denmark, Sweden, and Cyprus. This relation is lowest in Finland and Luxembourg.

Participation of retired (or other inactive) people is rather low in all countries. Only in Denmark, Sweden, Finland and Iceland, more than one in ten retired persons participated in a computer course in the last three years.

Also the participation across age groups differs considerably between countries. In New Member States (and Greece), participation of the youngest cohorts is tremendous with over 60 percent participation of the 16 to 24 year old in Lithuania (72%), Czech Republic (69%), Hungary, Cyprus, Greece and Slovenia. Contrarily, less than one in three participants among the youngest are found in Norway, Austria, Portugal, Italy, Slovakia, Luxembourg, Netherlands and Spain.

Of particular interest are also older workers who need to be skilled to retain work. For these older age groups, a completely different European pattern emerges. For example, looking at the 45-54 age group, the highest rates are found in Iceland (36%), and Finland (35%), followed by Sweden, UK, Norway, Germany and Denmark having each more than 25%. The lowest rates for the 45-54 year olds are found in Bulgaria (6%), followed by Latvia, Poland, Lithuania, Greece, Cyprus, Portugal, Hungary and Czech Republic (each under 15%). For the 55-64 age group the picture is similar (see Table 4-11).

Table 4-10 Percent of persons having taken a computer course in the last three *years* by employment situation (2006)

	Total population (16-74)	Employee or self-employed	Unemployed	Retired or other inactive
EU25	21.4	25.3	20.7	6.4
EU15	21.6	26.3	22.7	7.0
NewMS	20.4	19.7	11.8	3.1
BE	20.5	22.3	20.5	7.8
CZ	22.2	:	:	:
DK	23.8	23.6	21.5	13.3
DE	22.5	:	28.1	9.4
EE	15.2	:	:	:
EL	20.5	21.5	28.9	3.7
ES	16.1	20.5	16.2	5.0
FR	20.5	:	:	:
IE	27.9	31.0	20.4	9.3
IT	18.5	25.8	16.7	4.4
CY	22.0	20.1	17.9	8.1
LV	17.5	14.8	11.1	6.7
LT	21.4	18.0	10.3	2.0
LU	22.5	26.8	11.8	9.1
HU	21.5	21.5	13.2	4.0
NL	16.9	:	:	8.9
AT	19.4	19.8	20.4	5.3
PL	19.6	24.7	23.1	:
PT	15.1	:	:	:
SI	27.0	:	:	3.7
SK	20.2	31.3	19.9	3.9
FI	31.9	24.7	13.5	13.1
SE	30.7	34.4	31.0	13.3
UK	29.5	32.4	29.7	:
BG	11.0	:	:	1.4
IS	36.5	:	:	11.8
NO	22.8	:	:	7.6

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 4-11 Percent of persons having taken a computer course in the last three *years* by age (2006)

	Total population (16-74)	16-24	25-34	35-44	45-54	55-64	65-74
EU25	21.4	43.3	25.5	22.3	19.8	12.2	3.9
EU15	21.6	39.5	26.3	23.3	21.7	13.5	4.4
NewMS	20.4	59.1	21.4	15.9	11.3	5.2	0.7
BE	20.5	42.6	22.4	19.6	19.8	11.7	4.3
CZ	22.2	69.4	21.9	17.9	14.0	:	:
DK	23.8	36.2	24.8	22.9	25.3	19.7	12.5
DE	22.5	34.3	27.2	24.9	25.3	15.5	:
EE	15.2	43.7	:	:	:	:	:
EL	20.5	62.3	28.6	20.4	10.8	3.0	0.1
ES	16.1	21.1	21.9	20.3	15.9	6.8	2.3
FR	20.5	53.4	24.0	18.3	:	:	:
IE	27.9	45.7	33.5	27.4	22.8	14.3	5.7
IT	18.5	31.1	26.1	22.1	19.0	9.5	2.0
CY	22.0	64.4	24.2	17.1	11.5	5.0	0.7
LV	17.5	55.6	15.0	13.3	8.5	3.9	0.2
LT	21.4	72.4	18.7	11.4	9.8	4.2	0.4
LU	22.5	28.3	20.8	29.1	23.5	19.0	6.0
HU	21.5	66.4	23.2	18.3	12.8	6.1	1.0
NL	16.9	23.6	17.4	19.0	16.9	13.0	9.0
AT	19.4	31.7	21.8	23.6	20.7	9.4	:
PL	19.6	59.1	20.3	13.3	8.7	:	:
PT	15.1	31.2	22.3	15.1	11.5	:	:
SI	27.0	60.0	39.3	28.1	19.5	8.5	1.9
SK	20.2	29.0	23.0	23.1	23.4	7.7	0.3
FI	31.9	48.0	36.7	32.5	35.1	23.3	7.8
SE	30.7	46.7	32.0	33.0	31.7	25.3	10.4
UK	29.5	50.6	33.9	30.6	29.8	:	:
BG	11.0	36.2	11.5	9.1	6.4	2.0	:
IS	36.5	54.6	36.3	35.4	36.0	28.4	16.0
NO	22.8	32.8	22.7	24.0	25.4	19.4	5.5

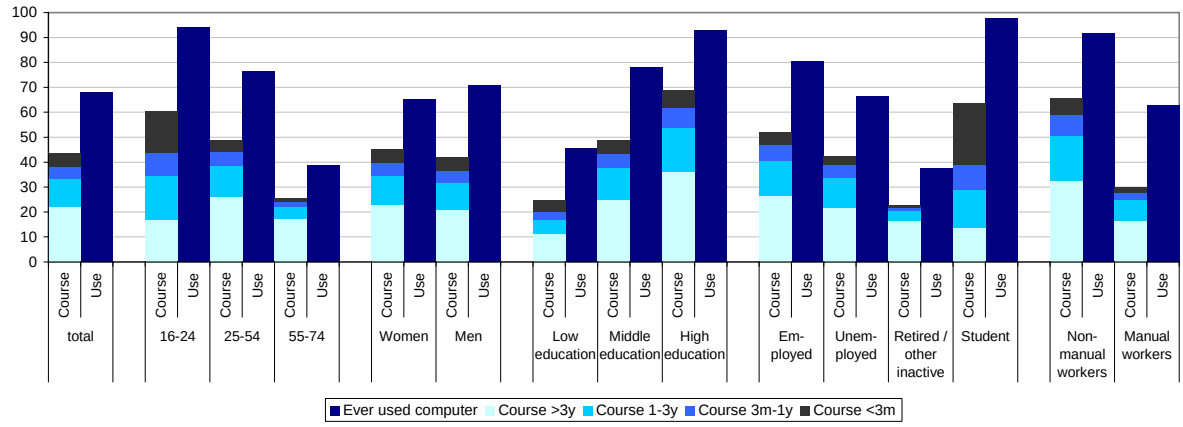
Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 4-12 Computer course participation by time elapsed since, EU25, 2006, by socio-demographics

	Have ever used computer	Have ever taken computer course	Computer course last 3 months	Computer course 3 months – 1 year ago	Computer course 1 – 3 years ago	Computer course > 3 years ago
Total EU25	67.9	43.6	5.4	5.0	11.1	22.1
Age 16-24	94.0	60.4	16.6	9.3	17.4	17.1
Age 25-54	76.3	48.6	4.5	5.4	12.6	26.1
Age 55-74	38.7	25.6	1.4	1.9	5.0	17.3
Women	65.3	45.0	5.3	5.1	11.6	23.1
Men	70.6	42.0	5.5	4.9	10.5	21.2
Low education	45.4	24.5	4.5	2.8	5.9	11.3
Middle education	77.8	48.8	5.5	5.5	13.1	24.8
High education	92.9	68.9	7.0	8.2	17.3	36.3
Densely populated	72.5	46.4	5.6	5.4	11.5	23.9
Intermediate	67.7	43.9	5.1	4.6	11.6	22.7
Thinly populated	60.4	38.6	5.4	4.6	9.8	18.9
Employed (incl. self-employed)	80.3	51.8	5.0	6.1	14.2	26.5
Unemployed	66.2	42.3	3.4	5.0	12.2	21.6
Retired and other inactive	37.5	22.9	1.1	1.3	4.0	16.5
Student	97.5	63.8	24.8	10.4	15.1	13.6
Non-manual worker	91.5	65.5	6.7	8.3	18.0	32.4
Manual worker	62.7	29.8	2.2	2.7	8.1	16.7
Age 16-24 and low education	91.6	54.2	20.1	8.7	13.4	12.0
Age 16-24 and middle education	95.5	64.3	13.7	9.4	20.4	20.8
Age 16-24 and high education	98.9	74.1	13.5	12.6	23.5	24.7
Age 25-54 and low education	50.7	24.8	1.8	2.2	6.3	14.4
Age 25-54 and middle educ.	81.8	49.8	4.6	5.5	13.1	26.6
Age 25-54 and high education	96.5	72.4	7.5	9.0	18.9	37.1
Age 55-74 and low education	20.2	11.7	0.7	1.0	2.3	7.8
Age 55-74 and middle education	52.8	34.1	1.6	2.4	7.2	22.9
Age 55-74 and high education	79.3	56.0	3.7	4.4	10.7	37.1
Women age 16-24	94.0	62.6	16.6	9.7	18.6	17.8
Women age 25-54	75.1	52.2	4.6	5.7	13.5	28.4
Women age 55-74	33.9	23.8	1.2	1.7	4.9	16.0
Men age 16-24	94.0	58.3	16.7	9.0	16.2	16.4
Men age 25-54	77.5	44.9	4.4	5.1	11.6	23.8
Men age 55-74	44.1	27.5	1.6	2.1	5.1	18.7
Women low education	41.3	24.5	4.4	2.8	5.7	11.6
Women middle education	77.1	52.9	5.3	5.7	14.4	27.4
Women high education	91.9	70.5	7.0	8.7	18.4	36.4
Men low education	49.8	24.5	4.6	2.8	6.1	11.0
Men middle education	78.6	44.7	5.6	5.3	11.7	22.1
Men high education	93.7	67.4	7.0	7.7	16.3	36.3

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Figure 4-16 Computer course participation



Source: Eurostat 2006 Community ICT Household survey

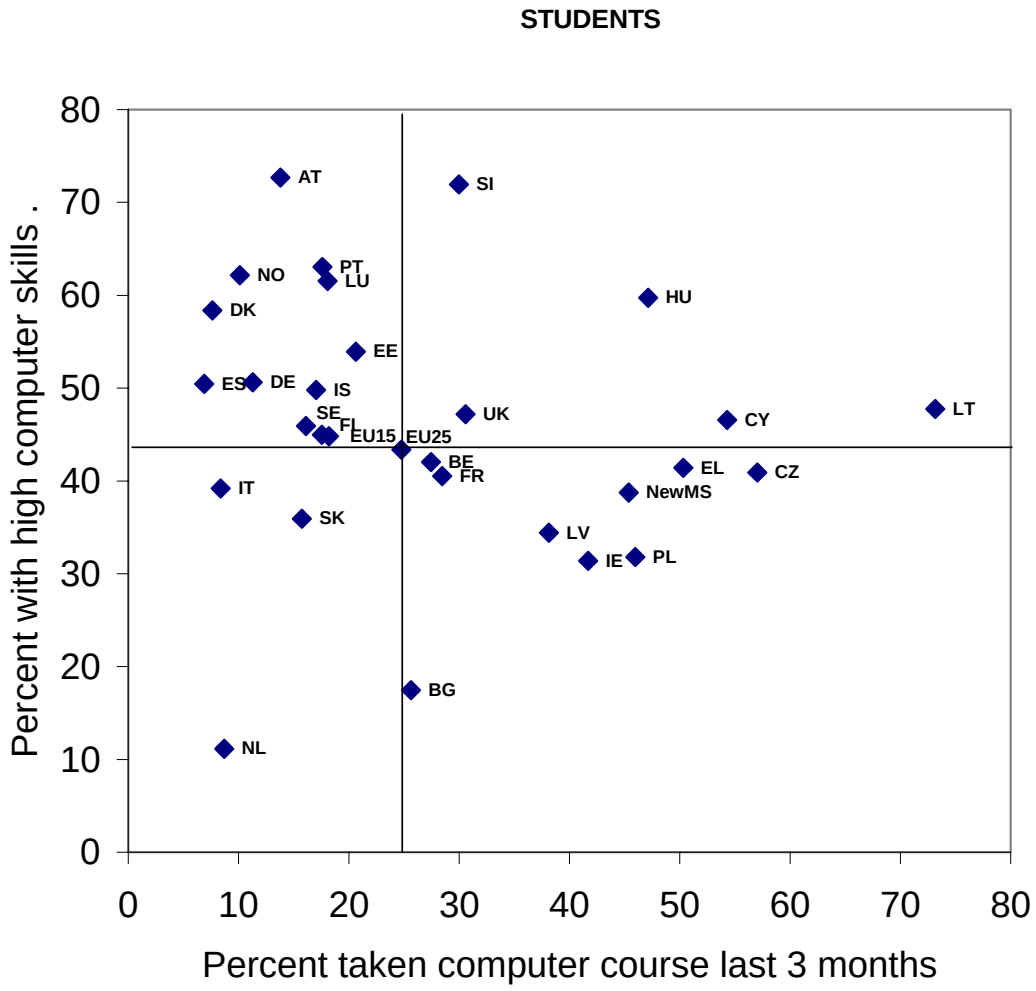
Women, although less likely to be computer users have more often taken part in computer courses. Students and the youngest age bracket are most likely to have recently taken computer courses.

Due to the lack of a frequency measure (information on how often respondents participated in computer courses) this can be seen as an indication that they take part in computer learning activities much more often. (Obviously, younger ages and students engage in learning more intensely than average)

A high variation of differences between socio demographic groups can be observed across countries. The highest socio-demographic variation can be found in Lithuania, Czech Republic, Cyprus and Greece while the lowest variability is found in Spain, Denmark, Italy and the Netherlands.

Some countries with rather low computer skills among students have high rates of computer learners. However, this pattern can not be observed in the Netherlands, Slovakia and Italy. There is apparently no general correlation between the two variables.

Figure 4-17 Computer skills and computer course participation among students in European countries



Source: Eurostat 2006 Community ICT Household survey

Table 4-13 Percent of students having taken a computer course in the last three months

	High computer skills	Taken computer course last 3 months
EU25	43.4	24.8
EU15	44.8	18.2
NewMS	38.7	45.4
AT	72.7	13.8
SI	71.9	30.0
PT	63.1	17.6
NO	62.2	10.1
LU	61.5	18.1
HU	59.7	47.1
DK	58.4	7.6
EE	53.9	20.6
DE	50.6	11.3
ES	50.5	6.9
IS	49.8	17.0
LT	47.8	73.2
UK	47.2	30.6
CY	46.6	54.3
SE	45.9	16.1
FI	45.0	17.5
BE	42.0	27.4
EL	41.4	50.3
CZ	40.9	57.0
FR	40.5	28.5
IT	39.2	8.4
SK	35.9	15.7
LV	34.4	38.1
PL	31.8	46.0
IE	31.4	41.7
BG	17.5	25.6
NL	11.1	8.7

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

4.7 The Source of Computer Skills

The source of computer skills was asked for by way of multiple choice questions on "where or how did you obtain the skills to carry out these activities". Two methods are predominant: "self-study (learning by doing)" and "informal assistance from colleagues, relatives, friends and some other ways". It can be concluded, that informal or ad-hoc ways to obtain IT skills are more important than formalised educational or employment related skills attainment.

Self study is particularly high in Estonia, Denmark, Iceland, Portugal and Italy (each over 80%), and particularly low in Norway, France, Lithuania, Ireland, Sweden, and the Czech Republic (each below 45%).

As for informal assistance, countries with a particularly high percentage are Germany, Estonia, Portugal, Slovenia and Denmark (each over 75%) and countries with a particularly low level Norway, France, Ireland, Sweden and Belgium.

Formalised educational activities are the source of most computer users' e-skills in most of the New Member States, namely Cyprus (50%), Lithuania (50%), Bulgaria (43%), Estonia (42%), Poland (42%), Hungary (41%), Slovenia (41%) and Latvia (40%), while it is lowest in the Netherlands (20%), Sweden (23%), Belgium (26%) and Norway (27%).

Training courses at own initiative have the highest number of participants in Estonia and Iceland (both more than 30%), followed by Greece, Cyprus, Ireland, Italy Austria, Estonia and Hungary (more than 20%).

On the other hand, training courses on demand of the employer are most common in Germany (38%), Denmark (32%), Sweden (30%) and Austria (29%). They are uncommon in Latvia, Lithuania, Bulgaria, Estonia, Ireland, Poland, Belgium and Greece (each below 15%).

Table 4-14 Source of computer and internet skills of computer users (2006)

Country	formalised educational institution	training courses and adult education centres, on own initiative	training courses and adult education centres, on demand of employer	self-study using books, cd-roms, etc.	self-study (learning by doing)	informal assistance from colleagues, relatives in friends and some other ways	some other way
EU25	31.4	16.3	24.6	3.6	60.2	57.9	17.7
EU15	29.9	17.0	25.9	3.6	60.8	58.1	21.0
NewMS	40.6	12.2	16.3	3.5	57.1	57.0	1.2
BE	26.3	12.1	13.0	2.0	55.0	42.5	3.0
CZ	34.4	13.9	23.6	3.8	43.1	45.6	1.3
DK	28.6	14.3	31.9	3.0	86.4	75.4	3.7
DE	32.9	19.5	38.4	4.7	73.6	84.3	12.9
EE	42.3	20.8	12.5	7.1	88.0	79.5	3.7
EL	38.2	27.0	13.3	1.8	64.7	52.0	1.1
ES	30.9	33.3	22.9	5.8	:	74.0	0.5
FR	27.7	4.1	18.5	3.2	31.9	18.1	:
IE	37.7	22.4	12.8	1.4	41.6	19.4	1.3
IT	27.7	21.4	18.7	4.7	80.9	66.2	6.3
CY	50.3	24.3	25.1	3.9	65.6	61.5	10.8
LV	40.3	11.3	9.5	1.9	46.4	51.6	0.1
LT	49.7	14.9	10.7	4.3	33.6	66.6	0.2
LU	31.5	18.7	21.5	3.3	76.0	61.7	37.4
HU	41.3	20.1	19.5	5.0	62.9	52.4	0.2
NL	20.6	11.6	24.2	2.2	77.8	62.3	0.4
AT	29.2	20.9	28.6	2.8	72.6	61.3	:
PL	42.0	7.8	13.0	2.7	57.5	56.3	1.1
PT	36.9	15.8	18.8	5.1	81.5	76.8	:
SI	40.9	16.0	22.4	4.3	75.4	75.7	0.3
SK	35.7	17.2	20.9	3.9	68.7	72.3	2.9
FI	28.8	13.5	20.4	2.1	63.2	52.3	1.5
SE	23.4	14.0	30.0	4.3	42.5	36.8	1.6
UK	30.6	14.8	24.2	1.7	49.3	45.3	77.9
BG	42.6	15.2	11.5	2.2	53.4	45.2	2.2
IS	39.5	30.6	21.3	3.4	83.0	69.3	1.8
NO	27.3	5.3	22.4	1.3	21.6	0.7	0.1

Source: Eurostat 2006 Community ICT Household survey (:) Data not available
Base: Individuals who have ever used a computer.
Survey question: Where or how did you obtain the skills to carry out these activities (tick all that apply)

Formalised education is a source of e-skills chiefly for the younger age bracket. Almost seven in ten youngest respondents report this type of source, followed by 44 percent in the 25 to 34 age bracket. With increasing age a sharp decline in the participation rates becomes apparent. Older generations rely much more on training courses and adult education centres on demand of their employer. Self-study via learning by doing is losing importance for older people compared to other age groups.

Another significant difference concerns employers' willingness to cater for training of manual and non-manual workers, with the latter (35%) receiving much more attention than the former (15%).

Table 4-15 Source of computer and internet skills of computer users, EU25, 2006, by socio-demographics

	formalised educational institution	training courses and adult education centres, on own initiative	training courses and adult education centres, on demand of employer	self-study using books, cd-roms, etc.	self-study (learning by doing)	informal assistance from colleagues, relatives in friends and some other ways	some other way
Total EU25	31.4	16.3	24.6	3.6	60.2	57.9	17.7
Age 16-24	69.0	8.4	6.1	3.3	61.6	59.5	16.4
Age 25 - 34	44.2	16.3	20.4	3.9	66.3	59.5	17.3
Age 35 - 44	19.1	19.1	30.9	4.0	65.6	59.7	18.3
Age 45 - 54	10.7	19.4	35.4	3.6	58.4	58.2	18.4
Age 55 - 64	7.5	18.5	36.6	3.2	49.4	52.5	19.7
Age 65 - 74	5.5	19.7	23.2	2.8	38.6	47.8	16.2
Women	33.0	18.6	25.8	3.0	54.8	57.5	16.9
Men	29.9	14.1	23.3	4.2	65.4	58.3	18.5
Low education	29.5	10.7	15.5	3.0	51.4	51.8	10.8
Middle education	30.1	16.9	24.9	3.5	61.9	60.7	19.2
High education	35.3	20.7	32.9	4.5	65.8	59.1	20.8
Densely populated	31.1	15.7	25.4	3.7	60.9	58.7	23.1
Intermediate	31.5	16.9	25.4	3.8	63.1	61.0	15.1
Thinly populated	31.8	16.8	22.1	3.4	55.7	53.1	9.7
Employed (incl. self-empl.)	28.1	17.3	29.7	3.9	64.1	59.5	19.4
Unemployed	34.0	18.0	20.3	3.4	54.4	54.9	14.8
Retired, other inactive	14.1	17.8	21.9	2.6	44.2	50.9	17.6
Student	72.1	7.8	2.4	3.8	65.0	60.9	9.9
Non-manual worker	30.7	17.2	35.4	3.9	67.1	58.8	23.1
Manual worker	21.1	11.0	15.3	3.0	55.8	55.4	17.9
Age 16-24, low educ.	67.2	6.6	4.0	3.1	59.1	59.9	8.4
Age 16-24, middle educ.	71.0	9.3	7.8	3.5	65.0	60.2	23.0
Age 16-24, high educ.	68.2	13.3	8.6	3.9	54.3	53.4	18.0
Age 25-54, low educ.	11.4	12.4	20.5	3.3	52.4	50.4	10.8
Age 25-54, middle educ.	22.3	18.7	28.6	3.6	64.7	62.1	18.1
Age 25-54, high educ.	38.8	21.0	33.3	4.6	69.2	60.3	21.1
Age 55-74, low educ.	3.5	14.4	24.7	2.2	34.8	39.7	15.7
Age 55-74, middle educ.	6.8	19.8	32.9	3.0	46.4	55.1	19.0
Age 55-74, high educ.	10.4	21.8	39.4	4.0	56.6	56.3	20.4
Women age 16-24	71.5	8.7	5.9	2.9	58.9	59.8	16.7
Women age 25-54	26.8	21.2	30.5	3.2	57.9	58.8	17.2
Women age 55-74	7.1	21.3	33.4	2.3	37.9	49.4	16.1
Men age 16-24	66.6	8.1	6.4	3.8	64.3	59.2	16.1
Men age 25-54	24.3	15.3	26.6	4.5	69.5	59.6	18.7
Men age 55-74	6.8	16.8	31.7	3.7	53.1	52.4	20.8
Women low educ.	31.5	12.7	16.7	2.5	46.9	51.0	10.5
Women middle educ.	31.7	19.7	27.6	2.9	56.4	60.1	18.7
Women high educ.	36.6	22.3	31.6	3.7	59.6	59.4	18.9
Men low educ.	27.6	8.9	14.4	3.5	55.6	52.5	11.1
Men middle educ.	28.6	14.1	22.2	4.1	67.5	61.3	19.8
Men high educ.	34.2	19.2	34.2	5.2	71.7	58.9	22.5

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Another interesting data breakdown now available provides information on the questions whether people with higher and lower ICT skills levels do report different ways of attaining their skills. Table 4-16 displays some of the data in this regard.

What is generally interesting to see is that people with higher skills levels also report on average more different sources of skills attainment than people with lower skills. People with high skills report on average 3.1 sources, while people with low skills report on average one source less (2.1).

The ranking of importance of the different sources is more or less the same for all three groups, the only exception being that informal assistance ranks first for low skill respondents and second for the medium and high skill groups, where self-study ranks first (second for low skills).

Table 4-16 Way of obtaining IT skills (2006), by level of computer skills

	Level of computer skills			
Way of obtaining IT skills	**Total**	**Low**	**Medium**	**High**
Formalised educational institution (school, college, university, etc.)	31.4	3.9	12.0	14.8
Training courses in adult education centres, on own initiative	16.3	2.8	6.4	6.5
Training courses in adult education centres, on demand of employer	24.6	4.0	10.1	9.5
Self-study using books, cd-roms, etc.	36.2	4.3	13.0	17.5
Self-study (learning by doing)	60.2	9.9	23.8	23.3
Informal assistance from colleagues, relatives or friends	57.9	12.0	22.3	19.1
Some other way	17.7	3.3	6.9	7.5
For comparisons: computer users skills levels	100.0	19.1	35.7	31.7
Average number of sources mentioned[11]	*2.4*	*2.1*	*2.6*	*3.1*
As percentage of skill groups[12]				
Formalised educational institution (school, college, university, etc.)	31.4	*20.2*	*33.7*	*46.7*
Training courses in adult education centres, on own initiative	16.3	*14.8*	*18.0*	*20.4*
Training courses in adult education centres, on demand of employer	24.6	*21.0*	*28.2*	*30.1*
Self-study using books, cd-roms, etc.	36.2	*22.4*	*36.5*	*55.2*
Self-study (learning by doing)	60.2	*51.6*	*66.8*	*73.6*
Informal assistance from colleagues, relatives or friends	57.9	*62.6*	*62.5*	*60.4*
Some other way	17.7	*17.1*	*19.4*	*23.6*

Source: Eurostat 2006 Community ICT Household survey *Data in italics: own calculation.*

IT Professionals

IT professionals are a new breakdown category based on the ISCO classification of occupations[13]. As can be expected, IT professionals have much higher computer and internet skills than the average population, as also the following table shows. However, only less than 40 percent have high internet skills.

[11] Calculated as sum of percentages of the items in the first seven rows divided by the total in row 8

[12] While in the upper part of the table, percentage refer to the total of all computer users, even for the columns with low, medium or high skills, in the lower part percentages are obtained by dividing the value by the total share of computer users with the respective skills level. For example: 20.2 = (100*)3.9/19.1

[13] ICT professionals classifications contains the following occupations:

1236: Computing services managers; 2131: Computer systems designers, analysts and programmers; 2139: Computing professionals not elsewhere classified; 2144: Electronics and telecommunications engineers; 3114: Electronics and telecommunications engineering technicians; 3121: Computer assistants; 3122: Computer equipment operators; 3132: Broadcasting and telecommunications equipment operators.

Table 4-17 IT skills levels of ICT professionals and average population (EU25, 2006)

		Low	Medium	High
ICT professionals	**Internet skills**	19.7	39.4	38.0
	Computer skills	1.9	14.2	82.3
EU25 Total population	**Internet skills**	31.1	19.7	5.9
	Computer skills	13.0	24.2	21.5

Source: Eurostat 2006 Community ICT Household survey.

IT professionals are much more likely to have received their IT skills from any source than the average respondent, with the exception of "informal assistance" and "some other way". In particular they are more likely to have obtained their skills from formalised educational institutions and through training courses on demand of their employers. There are substantial differences between countries as to how much a formalised educational degree seems to be a prerequisite for working as an IT professional. In Ireland, 89% state to have skills from this source, followed by Norway and Portugal with 75%. On the other side of the spectrum, in Finland (34%) and the Netherlands (38%) the smallest share of professionals say they have gained their skills from this source.

Table 4-18 Source of computer and internet skills of IT professionals (2006)

Country	formalised educational institution	training courses and adult education centres, on own initiative	training courses and adult education centres, on demand of employer	self-study using books, cd-roms, etc.	self-study (learning by doing)	informal assistance from colleagues, relatives in friends and some other ways	some other way
EU25	55.4	22.8	49.4	6.6	81.4	57.1	18.7
EU15	54.8	23.1	51.4	6.6	81.5	57.4	21.2
NewMS	59.9	21.2	34.9	6.5	80.9	54.5	2.7
BE	53.4	16.0	37.0	5.2	65.4	42.3	1.4
DE	69.1	22.9	71.6	8.5	94.9	81.9	27.8
EL	47.6	50.1	26.5	5.0	69.9	47.3	0.0
FR	63.2	:	:	:	:	:	:
IE	88.9	23.9	22.5	4.3	58.6	36.8	0.0
IT	40.8	35.6	48.9	7.4	88.5	58.2	6.9
CY	70.6	31.8	49.8	9.0	89.7	65.9	13.3
LV	66.8	10.4	17.6	2.9	57.8	40.3	0.0
LU	65.9	25.6	53.1	6.7	80.2	44.9	63.0
HU	69.5	25.0	31.8	5.4	68.1	34.6	:
NL	38.4	13.3	52.9	4.9	89.6	49.0	0.0
PL	67.2	15.5	38.0	5.8	82.2	40.7	4.9
PT	75.1	:	:	8.6	95.3	76.7	0.0
SI	46.9	33.1	28.1	7.6	92.1	75.2	0.0
SK	43.7	25.8	40.2	7.9	85.1	82.2	1.7
FI	34.2	8.6	34.8	4.0	77.6	40.2	0.0
SE	40.9	10.9	49.6	6.8	55.5	26.8	3.1
IS	60.8	49.4	42.4	7.1	92.6	71.1	3.7
NO	75.4	0.0	21.2	0.3	0.0	0.0	0.0

Source: Eurostat 2006 Community ICT Household survey (:) Data not available, no data for CZ, DK, EE, ES, LT, MT, AT, UK, BG, RO. Base: ICT professionals (based on ISCO-88) who have ever used a computer.

Also, further education on demand of the employer differs across countries. In Germany, by far the most (72%) professionals have participated in such courses. The share is much lower in all other countries.

4.8 ICT Skills in Enterprises - Recruiting

In the Eurostat Surveys on ICT Usage in Enterprises, respondents were asked about any difficulties that the enterprise had in the previous year in recruiting personnel with ICT skills. If respondents agreed to this statement, they were given three (multiple choice) options as to what kind of difficulties they had met: expert skills (item "ICT specialists with the required skills not available or not entirely suitable"), user skills (item "Personnel with required skills in the use of ICT applications not available or not entirely suitable") and high remuneration for ICT experts (item "High remuneration costs of ICT specialists").

Given the public attention that employers' claims about the skills gap have gained recently, one might expect an actually higher share of enterprises that state difficulties in this regard. Less then 6 percent of all European enterprises do so, while 44 percent had no difficulties and more than 50 percent did not recruit personnel with ICT skills. However, this figure does not give any information about how many positions had to remain unoccupied since difficulties in recruiting is not differentiated by how many vacancies were actually to be filled. The apparent difficulties that large firms meet are weighted here to the same extent as smaller firms. However, the weight of the influence of large employers of IT specialists on the labour market can not be measured in such a way.

Table 4-19 Difficulties of enterprises in recruiting personnel with ICT skills during 2005

	Had **difficulties** in recruiting personnel with ICT skills	Did **not** have **difficulties** in recruiting personnel with ICT skills	Did **not need** to recruit personnel with ICT skills	**Don't know** if difficulties recruiting personnel with ICT skills
EU25	5.6	43.6	51.4	:
EU15	5.7	44.6	49.3	:
*NewMS***	*4.6*	*37.7*	*66.7*	*:*
BE	4.9	45.9	49.1	0.2
CZ	4.3	39.1	56.5	:
DK	5.9	55.1	37.6	1.4
DE	3.4	40.5	55.3	0.7
EE	4.9	40.5	54.6	0.0
EL	15.0	59.1	25.9	0.0
ES	3.0	53.7	43.3	:
FR	16.7	24.4	58.6	0.3
IE	3.8	26.5	66.0	3.8
IT	2.8	31.4	65.8	:
CY	7.4	17.5	75.1	:
LV	2.9	53.3	43.8	0.0
LT	9.3	42.9	47.8	:
LU	4.4	53.3	42.1	0.2
HU	10.8	89.2	:	:
NL	4.6	26.1	69.3	:
PL	1.8	17.9	80.3	:
PT	:	6.4	92.2	0.0
SI	8.4	20.6	71.0	:
SK	3.5	39.7	56.8	0.0
FI	4.7	36.8	57.8	0.7
SE	4.0	36.7	56.3	3.0
UK	6.5	93.5	0.0	:
BG	12.9	66.0	21.2	0.0
IS	7.0	65.8	26.2	1.0
NO	2.8	33.3	62.9	1.0

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available ***: Data insecure, total=109%*
Base: enterprises using computers. No data available for Malta, Austria, Romania

The share of enterprises that actually had to recruit personnel with ICT skills varies considerably across Europe. In Bulgaria, Greece and Iceland, more than 70 percent of

enterprises state that they have actually recruited or tried to recruit people with ICT skills[14] and more than 50 percent in Denmark, Luxembourg, Spain, Latvia, Lithuania and Belgium. The lowest shares with less than 30 percent of firms having tried to hire IT savvy personnel are found in Poland, Cyprus and Slovenia.

Firms in France were most unsuccessful in filling their vacancies: 17 percent (of all enterprises (that is 68% of those enterprises which tried to recruit) did report problems, followed by Greece (15%, 25%) and Bulgaria (13%, 20%). Compared to those which tried to recruit, the share was also particularly high in Cyprus (7.4%, 42%) and Slovenia (8.4%, 41%).

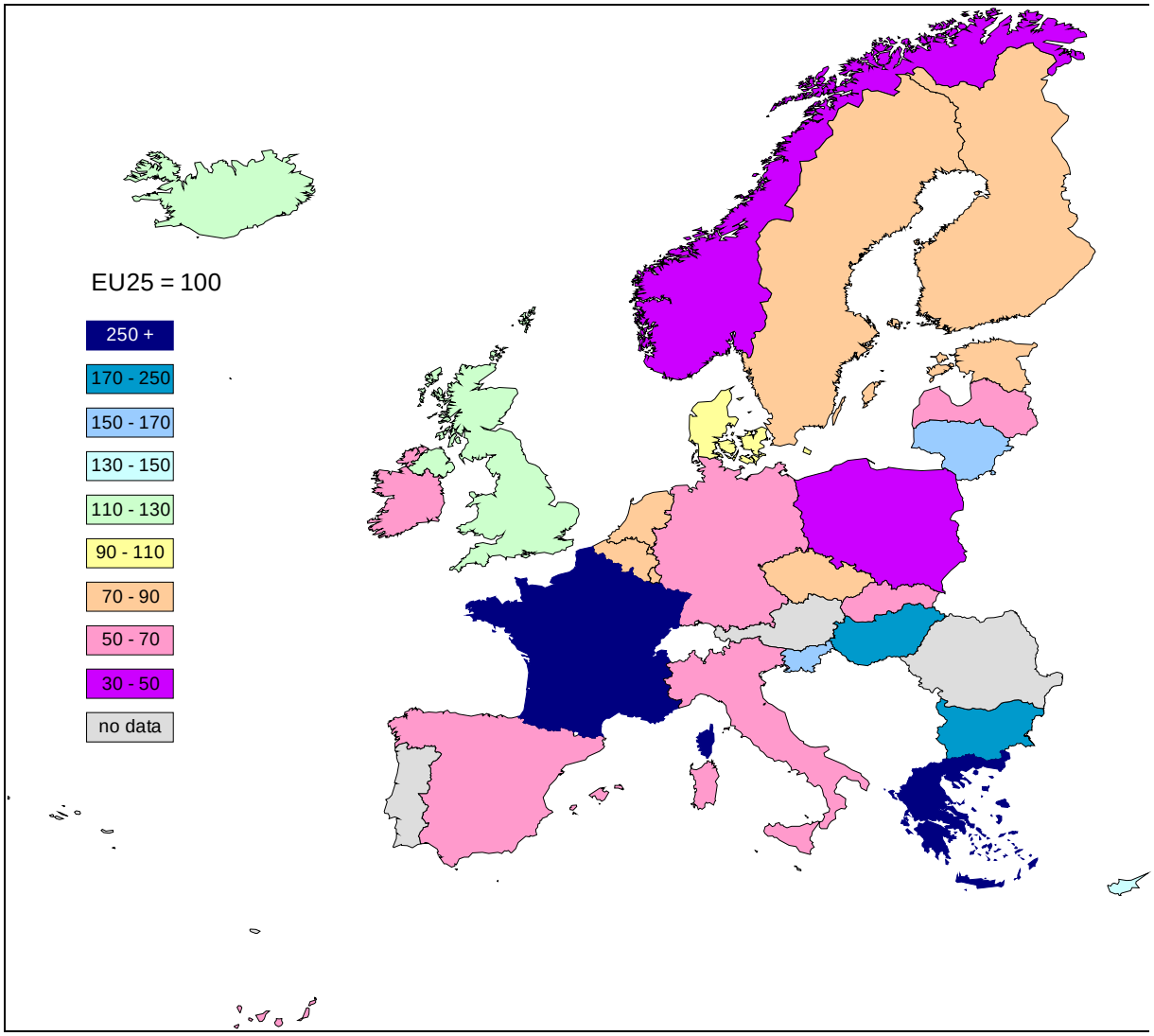
Table 4-20 Difficulties of enterprises in recruiting personnel with ICT skills by expertise level

	Had **difficulties** in recruiting personnel with ICT skills	***of which agreed that***		
		ICT specialists were not available or not entirely suitable	Personnel with **ICT applications skills** not available or not entirely suitable	**High remuneration** costs of ICT specialists
EU25	5.6	2.9	3.8	2.2
EU15	5.7	3.0	3.9	2.1
NewMS	4.6	2.3	2.8	2.5
Eurozone	5.7	2.9	4.1	1.9
BE	4.9	3.5	2.6	2.1
CZ	4.3	2.3	2.7	2.0
DK	5.9	3.7	2.9	2.5
DE	3.4	1.2	2.0	1.5
EE	4.9	2.9	2.6	3.1
EL	15.0	6.6	10.4	5.9
ES	3.0	2.0	1.7	1.6
FR	16.7	7.8	14.5	3.4
IE	3.8	2.5	1.7	1.5
IT	2.8	2.1	1.9	1.2
CY	7.4	3.9	5.2	1.7
LV	2.9	1.5	2.0	1.1
LT	9.3	4.7	6.2	5.8
LU	4.4	1.7	3.9	1.5
HU	10.8	5.3	6.6	7.8
NL	4.6	2.9	1.3	2.2
PL	1.8	0.9	1.0	0.8
PT	:	:	:	:
SI	8.4	4.5	5.9	3.3
SK	3.5	1.9	2.5	1.4
FI	4.7	2.4	3.4	1.7
SE	4.0	2.7	2.0	1.1
UK	6.5	4.1	3.3	4.1
BG	12.9	7.3	9.2	5.6
IS	7.0	2.2	3.0	1.6
NO	2.8	1.5	1.3	0.8

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria, Romania

[14] In the UK and Hungary, data suggest that nearly 100 percent of enterprises tried to hire people with ICT skills. However, it is likely that these data are not correct.

Figure 4-18 Enterprises having difficulties recruiting personnel with ICT skills, EU25=100



Source: Eurostat 2006 Community Enterprise ICT survey Base: enterprises using computers.
No data available for Malta, Austria, Portugal and Romania

Difficulties to recruit applied more to the supply of mostly user skills rather than expert or practitioner skills. While 2.9 percent of European enterprises report that they had difficulties with the latter, 3.8 percent report the former. Complaints about too high remuneration are also rather scarce, only 2.2 of businesses say so.

Both expert skills and user skills are especially scarce in France (expert: 7.8% user: 14.5), Bulgaria (7.3%, 9.2%) and Greece (6.6%, 10.4%). High remuneration is complained about apart from these three countries also in Hungary, Lithuania and the UK.

The difficulties to recruit are unevenly spread across industries. Those industries that presumably have the highest share of IT people also report most difficulties: computer and related activities (26%) and post and telecommunications (11%). These industries also have the highest shares of enterprises which tried to recruit: 77% for computer and related activities, and 67% for post and telecommunications.

Table 4-21 Difficulties of enterprises in recruiting personnel by NACE sector

		Had **difficulties** in recruiting personnel with ICT skills	Did **not** have **difficulties** in recruiting personnel with ICT skills	Did **not need** to recruit personnel with ICT skills
Section D	"Manufacturing"	4.4	38.6	57.9
D15 – D22	Manufacturing I (Food, textiles, leather, wood, paper)	4.1	35.5	61.3
D23 – D25	Manufacturing II (Coke, chemicals, rubber)	4.5	45.1	51.2
D26 – D28	Manufacturing III (Other non-metallic mineral products, basic metals)	4.1	37.7	59.0
D29 – D37	Manufacturing IV (Machinery, electrical/optical equipment, transport equipment, manufacturing n.e.c.)	5.1	41.4	54.4
Section F	"Construction"	3.2	39.1	58.2
Section G	"Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods"	5.6	44.8	50.3
G50	Sale of motor vehicles	4.6	45.4	50.7
G51	Wholesale	6.1	47.4	47.2
G52	Retail trade	5.5	41.6	53.8
Groups 55.1 and 55.2	"Hotels" and "Camping sites and other provision of short-stay accommodation"	5.1	50.9	44.4
Section I	"Transport, storage and communication"	5.2	44.3	51.2
I60 – I63	Transport, storage and communication	4.7	43.4	52.5
I64	Post and telecommunications	10.9	56.0	33.6
Section K	"Real estate, renting and business activities"	9.7	52.4	38.2
K70. K71. K73. K74	Real estate, renting and business activities, except Computer and related activities	7.1	52.5	40.7
K72	Computer and related activities	25.8	51.6	22.7
Groups 92.1 and 92.2	"Motion picture and video activities" and "Radio and television activities"	7.2	51.2	41.7

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania

The computer sector is also the sector by far most likely to experience IT practitioner skills shortages. 22 percent of enterprises say they have problems to recruit appropriately skilled people, while in all other industries the share of enterprises which say so is below 8 percent. To a smaller extent this is also true for lack of user skills, which finds 12 percent agreement in the computer sector and less than 6.1 percent anywhere else and for the high remuneration (13% in computer activities and less than 6.5% elsewhere).

Large enterprises are much more likely to face difficulties recruiting personnel with ICT skills than smaller ones and also, more pronounced even, this is the case for IT practitioner skills.

Table 4-22 Difficulties of enterprises in recruiting personnel by NACE sector and by expertise level

			of which...		
		Had **difficulties** in recruiting personnel with ICT skills	**ICT specialists** were not available or not entirely suitable	Personnel with **ICT applications skills** not available or not entirely suitable	**High remuneration** costs of ICT specialists
Section D	**"Manufacturing"**	**4.4**	**2.0**	**3.0**	**1.8**
D15 – D22	Manufacturing I (Food, textiles, leather, wood, paper)	4.1	1.7	2.6	1.5
D23 – D25	Manufacturing II (Coke, chemicals, rubber)	4.5	1.8	3.0	1.8
D26 – D28	Manufacturing III (Other non-metallic mineral products, basic metals)	4.1	2.2	2.8	2.1
D29 – D37	Manufacturing IV (Machinery, electrical/optical equipment, transport equipment, manufacturing n.e.c.)	5.1	2.3	3.6	2.0
Section F	**"Construction"**	**3.2**	**1.4**	**2.3**	**0.9**
Section G	**"Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods"**	**5.6**	**2.7**	**4.0**	**2.3**
G50	Sale of motor vehicles	4.6	2.1	3.3	1.7
G51	Wholesale	6.1	3.0	4.4	2.3
G52	Retail trade	5.5	2.8	3.9	2.6
Groups 55.1 and 55.2	"Hotels" and "Camping sites and other provision of short-stay accommodation"	5.1	1.7	4.2	1.6
Section I	**"Transport, storage and communication"**	**5.2**	**2.5**	**3.5**	**2.2**
I60 – I63	Transport, storage and communication	4.7	2.1	3.4	1.9
I64	Post and telecommunications	10.9	7.7	6.1	6.5
Section K	**"Real estate, renting and business activities"**	**9.7**	**6.2**	**5.9**	**3.8**
K70. K71. K73. K74	Real estate, renting and business activities, except Computer and related activities	7.1	3.6	4.8	2.4
K72	Computer and related activities	25.8	22.2	12.3	12.7
Groups 92.1 and 92.2	"Motion picture and video activities" and "Radio and television activities"	7.2	5.4	4.8	3.4

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania

Table 4-23 Difficulties of enterprises in recruiting personnel by size

		Had **difficulties** in recruiting personnel with ICT skills	Did **not** have **difficulties** in recruiting personnel with ICT skills	Did **not need** to recruit personnel with ICT skills
EU25	Small	5.0	42.2	53.5
	Medium	7.1	49.5	44.0
	Large	14.6	53.5	32.1

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania

Table 4-24 Difficulties of enterprises in recruiting personnel by size and by expertise level

		Had **difficulties** in recruiting personnel with ICT skills	*of which...*		
			ICT specialists were not available or not entirely suitable	Personnel with **ICT applications skills** not available or not entirely suitable	**High remuneration** costs of ICT specialists
EU25	Small	5.0	2.5	3.4	1.9
	Medium	7.1	3.8	4.6	2.8
	Large	14.6	11.2	8.2	8.1

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania

Table 4-25 Difficulties of enterprises in recruiting personnel by secondary/tertiary sector and by size

		Had **difficulties** in recruiting personnel with ICT skills	Did **not** have **difficulties** in recruiting personnel with ICT skills	Did **not need** to recruit personnel with ICT skills
EU25, Manufacturing and Construction*	Small	3.5	36.8	60.4
	Medium	5.2	46.2	49.4
	Large	11.2	53.6	35.8
	Total	4.0	38.7	58.0
EU25, Services*	Small	6.2	46.8	47.7
	Medium	8.8	52.7	38.9
	Large	17.8	53.6	28.7
	Total	6.9	47.7	45.9

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania
* Manufacturing and Construction: NACE D and F, Services: NACE G, H55.1+55.2, I, K, O92.1+92.2

Table 4-26 Difficulties of enterprises in recruiting personnel by secondary/tertiary sector, by size, and by expertise level

		Had **difficulties** in recruiting personnel with ICT skills	*of which...*		
			ICT specialists were not available or not entirely suitable	Personnel with **ICT applications skills** not available or not entirely suitable	**High remuneration** costs of ICT specialists
EU25, Manufacturing and Construction*	Small	3.5	1.5	2.5	1.3
	Medium	5.2	2.5	3.5	2.0
	Large	11.2	7.8	6.8	5.4
	Total	4.0	1.8	2.8	1.5
EU25, Services*	Small	6.2	3.3	4.2	2.4
	Medium	8.8	5.1	5.7	3.6
	Large	17.8	14.2	9.5	10.6
	Total	6.9	3.9	4.6	2.8

Source: Eurostat 2006 Community Enterprise ICT survey (:) Data not available
Base: enterprises using computers. No data available for Malta, Austria and Romania
* Manufacturing and Construction: NACE D and F, Services: NACE G, H55.1+55.2, I, K, O92.1+92.2

5 EU Statistics Compared to Other Sources

In the aftermath of the burst of the so-called dot-com bubble, many observers claimed that previous projections of shortages concerning ICT practitioners were hugely overblown. Indeed the study by the RAND corporation[15] (Frinking et al. 2005) came to the conclusion that there were "no widespread significant shortages of ICT (or IT) Practitioner skills within the EU at the aggregate level, although the growth in demand for skills for certain ICT Practitioner occupations was greater than for others" (ibid.) This finding appears to be well in line with Eurostat's results as reported above (chapter 4.8).

The same study, however, also pointed out that mismatches within the group of ICT practitioners remain a challenge. Moreover, current trends with regard to students enrolled in ICT-related higher education courses point towards stagnation in many EU countries, which might risk the longer-term ability of EU employers to fill their skills needs.

In a research report published in September 2005 commissioned by Cisco Systems[16] (Kolding & Kroa 2005), IDC explored the current situation and projected future development regarding networking skills, defined as “people needed to plan, design, manage, and support the networking technologies in the organization”. Shortages are most significant in the area of “advanced network technology skills” (a subgroup of total networking skills) which deal with new network developments such as IP telephony, security, and wireless networking. For the whole of the EU, the study estimates:

> *[...] that the actual number of skilled people needed to fill the advanced skills gap will be around 160,000 in 2005, growing to some 500,000 by 2008. These figures represent skills gaps as a proportion of total demand of 8.1% in 2005 and 15.8% in 2008.*
>
> *[Regarding total networking skills] IDC estimates a shortage of people with networking skills of around 230,000 in 2005, increasing to 615,000 by 2008. In percentage terms, the gap, as a proportion of demand, is expected to increase from 6% in 2005 to 11.8% by 2008.*

Because of the significance of networking skills in a knowledge economy which is more and more driven by value generation in networks, the study authors stress that estimated skill shortages would be not so much a problem in themselves, but rather that they would keep down efficiencies and “hold back Europe’s competitiveness in the global market”.

The e-Business Watch studied the problems that enterprises may have in acquiring the needed ICT skills. The e-Business watch data is based on sectoral data for ten sectors, and enterprises of all sizes were interviewed.

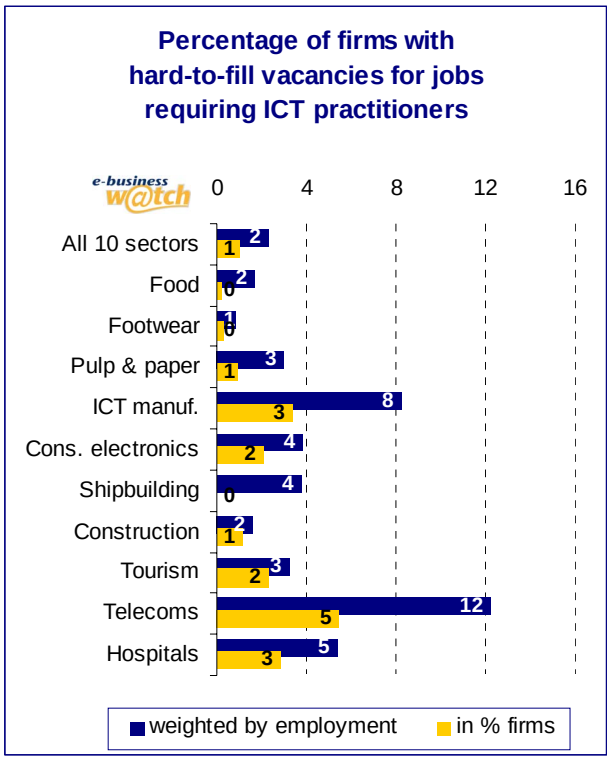
Enterprises were asked whether they had "hard-to-fill" vacancies for jobs requiring ICT practitioners". This question is comparable to the Eurostat question about the lack of ICT specialists. As reported above, 2.9 percent of firms reported this lack in the Eurostat surveys, ranging up to 7 percent in Greece and Bulgaria. The sectoral peak is found in the NACE sector K with 6.2 percent, and there especially in K72 (Computer and related activities) with 22 percent. Comparing these figures with the results of the e-Business watch is possible to some extent. One has to bear in mind though that sectoral definitions differ in some cases

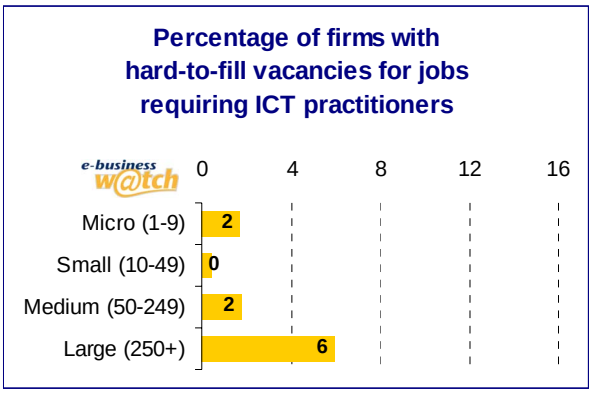
[15] Frinking, E., Ligtvoet, A., Lundin, P. and Oortwijn, W. (2005) ‘The Supply and Demand of e-Skills in Europe’, Study for the European Commission and the European e-Skills Forum, Leiden: RAND Europe.

[16] Kolding, M. and V. Kroa (2005): Networking Skills in Europe: Will an Increasing Shortage Hamper Competitiveness in the Global Market? IDC White Paper, September 2005. http://www.cisco.com/edu/emea/general/pdf/IDC_Networking_Skills_Shortage_EW_Europe_FINAL_5_Oct.pdf

(as well as the fact that – already mentioned above - different employee threshold and country coverage were used).

Figure 5-1 e-Business Watch: Percentage of enterprises having hard-to-fill vacancies for jobs requiring ICT practitioners (2006)





Source: e-Business W@tch – Survey 2006. Base (100%): enterprises using computers; N = 7237 for "all sectors" (EU-10). The "EU-10" consist of CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK.

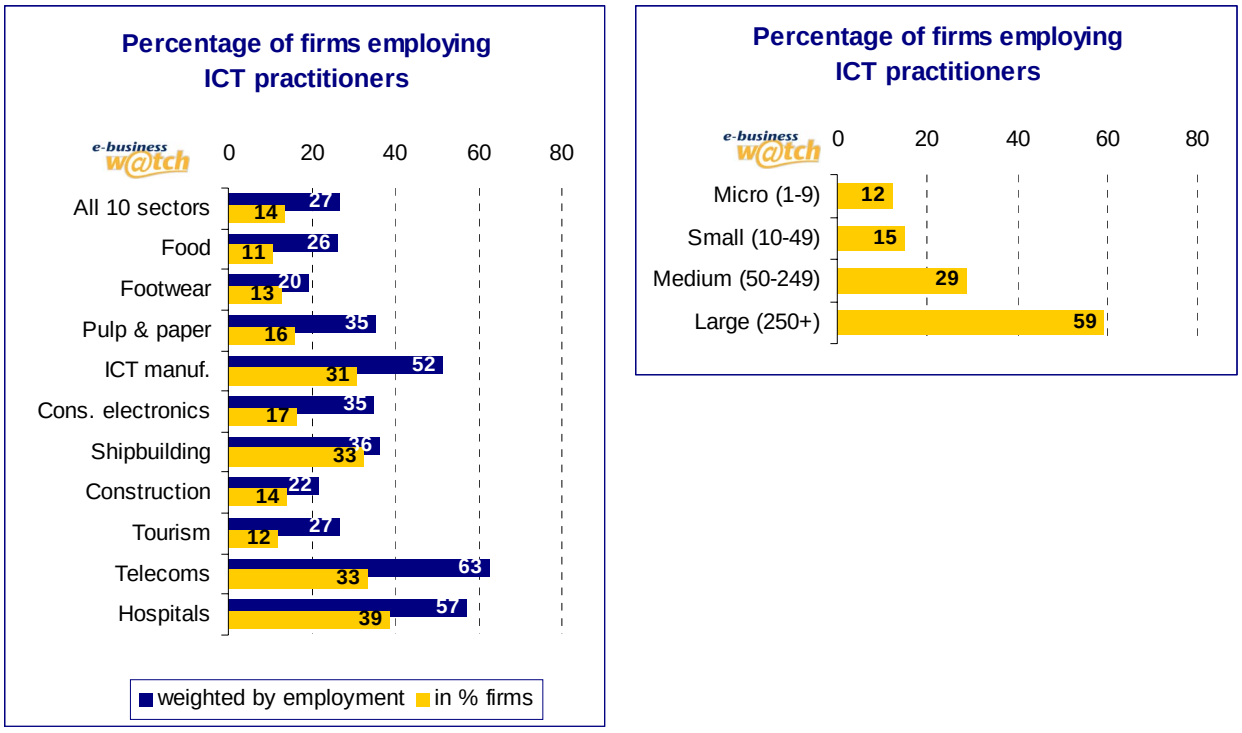
Table 5-1 Comparison e-Business Watch / Eurostat: enterprises' difficulties to recruit ICT specialist personnel

e-Business watch: Percentage of firms which had hard-to-fill vacancies for jobs requiring ICT			Eurostat: Percentage of firms saying ICT specialists were not available or not entirely suitable		
Definition	**Sector**	**%**	**Definition**	**Sector**	**%**
DA 15 (most groups)	Food and beverages	0.2	D15 – D22	Manufacturing I (Food, textiles, leather, wood, paper)	1.7
DC 19.3	Footwear	0.3			
DE 21	Pulp, paper and paper products	0.9			
DL 30, 32.1+2	ICT manufacturing	3.4	D29 – D37	Manufacturing IV (Machinery, electrical/optical equipment, transport equipment, manufacturing n.e.c.)	2.3
DL 32.3	Consumer electronics	2.1			
DM 35.11	Shipbuilding and repair	0.1			
F 45.2+3 (most classes)	Construction	1.2	Section F	Construction	1.4
H 55.1/3; I 63.3; O92.33/52	Tourism	2.3	Groups 55.1 and 55.2	Hotels and Camping sites and other provision of short-stay accommodation	1.7
I 64.2	Telecommunications	5.5	I64	Post and telecommunications	7.7
N 85.11	Hospital activities	2.8	--	--	--

Source: e-Business W@tch – Survey 2006 and Eurostat 2006 Community Enterprise ICT survey
e-Business Watch: enterprises using computers, >0 employees, CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK.
Eurostat: EU25, all enterprises >10 employees.

The e-Business Watch also enquired as to whether ICT practitioners are employed by enterprises at all. It turns out that a substantial share of firms report not to employ ICT practitioners. e-Skills development strategies differ substantially between industries, size classes and depending on whether firms have a specialised IT department.

Figure 5-2 e-Business Watch: Percentage of enterprises having hard-to-fill vacancies for jobs requiring ICT practitioners (2006)



Source: e-Business W@tch – Survey 2006. Base (100%): enterprises using computers; N = 7237 for "all sectors" (EU-10). The "EU-10" consist of CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK.

The e-Business Watch also looks into the specific areas where lack of skills is a concern. Those companies that reported hard-to-fill vacancies are mainly concerned about a lack of practitioners for ICT strategy, security, and developing new business solutions, while finding people for the 'basic' IT maintenance (hardware, networks) is a lesser concern. Furthermore the use of ICT training programmes was looked into as was the development of outsourcing ICT services to external providers.[17]

Another study examining the spread of e-skills was the eUser study[18]. eUser had two approaches of operationalising e-skills. Firstly, the period of internet experience was asked retrospectively. eUser respondents were asked to state when (in which year) they had first used the internet.

[17] Cf. questionnaire: http://www.ebusiness-watch.org/about/documents/eBiz_Questionnaire_2006.xls

[18] http://www.euser-eu.org/

Table 5-2 eUser data on length of Internet usage experience

First use of internet	CZ	DK	DE	FR	HU	IE	IT	PL	SI	UK	Overall sample
1998 or before	30.8	61.5	43.5	30.3	20.5	41.1	39.3	23.3	44.4	47.8	40.2
1999 - 2001	40.0	26.0	40.1	41.8	34.9	39.5	40.0	43.3	37.6	32.9	37.0
2002 - 2003	20.7	7.9	12.1	17.7	27.1	15.1	11.8	22.6	12.5	12.4	15.1
2004 - 2005	6.8	3.2	3.9	9.2	14.7	4.2	7.5	9.4	3.0	6.9	6.5
do not remember	1.7	1.4	0.5	1.1	2.8	0.1	1.3	1.4	2.5	0.0	1.2
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: User 2005. Base: All persons who have at least once used the Internet (population 18+).

The data on length of usage experience is a proxy for internet skills. For the proxy to be a valid measure of e-skills, it builds on the implicit assumption that respondents have had more or less continuous usage histories and that learning by doing is a major source of user skills. Admitted that these are far reaching assumptions, the proxy has nevertheless been shown as being associated with usage variables such as the use of e-government, as the following table shows: 26.7 percent of all internet users with experience dating back to 1998 and before have been found to be e-government users, while among novice users of less than two years internet experience (the survey took place in 2005), the share of e-government users is 3.5 percent[19].

Table 5-3 eUser data: Share of e-government users by internet usage experience

First use of internet	CZ	DK	DE	FR	HU	IE	IT	PL	SI	UK	Overall sample
1998 or before	12.8	42.1	21.1	37.1	21.4	26.7	13.8	19.6	21.6	26.3	26.7
1999 - 2001	10.0	26.5	13.5	22.4	11.5	19.4	4.6	11.5	12.9	16.8	15.0
2002 - 2003	5.5	5.8	4.5	16.7	8.7	17.9	8.4	8.1	6.9	16.8	10.1
2004 - 2005	0.0	13.9	5.9	2.6	1.3	1.2	0.0	6.0	12.7	2.4	3.5

Source: eUser 2005. Base: All persons who have at least once used the Internet (population 18+).

Another approach to operationalise e-skills in eUser was to ask about how confident people were to be able to carry out computer related tasks. This approach is different from the Eurostat approach as it does not require having actually carried out an action for the respondent to agree to the respective question. The items enquired were "using a search engine to find information on the Internet", "using e-mail to communicate with others", "downloading and installing software onto a computer" and "identifying the cause for computer problems". Respondent could answer on a five point scale from “not at all confident” (1) to “very confident” (5). Since the eUser indicators differ substantially to the Eurostat ones, data are hardly comparable.

[19] Due to the restrictions in overall sample size, the subgroups of novice users in countries are rather small but the total sample value should be reliable.

6 Future Developments and Recommendations for Survey and Questionnaire Design:

It is understood that both the enterprise and the household surveys have almost reached their limits in terms of size and respondent burden. Therefore any recommendation that suggests additional survey questions should be perceived as food for thought with regard to dedicated surveys or potential special one off modules that augment the regular surveys.

Enterprise Survey

The often claimed skills shortage on the one hand and the somewhat contradictory survey data poses the question as to where actually there would be an urgent need for policy intervention. The breakdown by size, country and industry has given some ideas about which shortages are real bottlenecks for economic growth. However, the need for a further investigation into the kinds of skills that are hard to obtain at the labour market may be concluded from this incoherent picture. Therefore, thought may be given to further breaking down the kind of skills needed. Currently, difficulties recruiting "user skills" and "expert skills" are measured. This may be refined by breaking down expert skills into, as IDC claimed for instance, networking skills, and a number of other skills to be defined such as software specialists, web administration, database management, engineering, etc. The breakdown could also follow the ISCO categories (Computing services managers, Computer systems designers, analysts and programmers, Computing professionals not elsewhere classified, Electronics and telecommunications engineers, Electronics and telecommunications engineering technicians, Computer assistants, Computer equipment operators, Broadcasting and telecommunications equipment operators). Another option would include the use of formal educational levels or certifications acquired, including public and vendor based certifications.

The educational market for ICT professionals has been subject to structural changes in many European countries in recent years. Vendor based certification schemes have been introduced, and vendor specific schemes exist partly in parallel to public vocational or tertiary education systems, and have elsewhere been introduced through public-private-partnerships (PPPs), where industry and public educational bodies have aligned their specifications of curricula and certification issuing. As these developments evolve it may be worthwhile not only to assess scarcities but also to see how enterprises rate the different kinds of certifications and training schemes.

Awareness and interest in vendor based and public educational system based diplomas could be surveyed as well as employment of these personnel.

The enterprise survey currently concentrates on recruitment of ICT skilled personnel. Consequently, the current stock of ICT skills at European firms is neglected. Therefore, additionally surveying the current situation with regard to employee skills should be given some consideration. For instance, employers could give an indication as to the job criteria or competencies needed from employees and to what share of employees these criteria to be defined apply.

Household Survey

Currently, the household survey investigates the (formal) acquisition of skills through computer learning courses, the actual skills level by six items each on computer usage and internet usage, and the role of different persons or organisations in acquiring these skills. The 2007 survey additionally looks into barriers to taking computer courses (reason for not taking computer courses surveyed are sufficient skills, lack of need because of non-usage, lack of time, course costs, no suitable offers available, and courses being too difficult), and asks if respondents think that their skills are sufficient for their job requirements.

Additional issues that maay deserve covering are the actual skills requirements of the respondents' job. The role of e-skills in employment and for the employability of the individual is currently a strong argument for policy to put emphasis on digital literacy and e-skills in the way it does. Therefore, the role of ICT in employment could be investigated further. Employees may be asked about a list of skills that are required in their day to day work routine and how much they are confident to meet the requirements they are exposed to at the workplace.

A survey of employees ICT related job competencies could match and be analysed together with a corresponding question in enterprise surveys, as mentioned above. This way, the national and European stock of job related ICT related human capital could be analysed Europe wide.

In this context, also the topic of "e-business skills" needs to be clarified. The definitions offered e.g. by European e-Skills Forum has proposed to include e-business skills as one of three core categories of e-skills. The question hence arises whether and how one could measure e-business skills. The e-Skills Forum definition ("the capabilities needed to exploit opportunities provided by ICT, notably the Internet, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, and to establish new businesses", and then, "e-Business skills are strategic and related in particular to innovation management, rather than technology-management") has not yet been very concrete as to what measurable skills are actually covered under this term.

7 Annex: Additional Data Tables

Unlike the data presented in chapter 4.1, the data in the table below refer to the basis of the total population. This information is given here additionally because it may be interesting as an indication of society or economy wide supply of special skills. However, in the study narrative we chose to provide this kind of societal supply related information only with regard to the aggregated compound indicators in chapter 4.4.

Table 7-1 Percent of *population* having carried out different computer related activities (2006)

	copied or moved a file or folder	used copy or cut and paste tools to duplicate or move information on screen	used basic arithmetic formulae to add, subtract, multiply or divide figures in a spreadsheet	compressed files	connected and installed new devices, e.g. a printer or a modem	written a computer programme
EU25	54.7	52.8	38.4	29.6	38.6	9.0
EU15	56.0	54.7	39.9	31.0	41.4	9.6
NewMS	47.5	43.1	30.9	22.3	24.6	5.8
Eurozone	54.3	52.9	37.8	30.2	40.1	8.9
BE	57.1	50.2	39.2	30.1	35.8	7.4
CZ	49.2	45.0	31.6	27.7	20.4	3.9
DK	78.6	75.0	65.0	44.7	57.8	19.4
DE	68.0	66.8	49.6	32.5	51.4	10.9
EE	46.7	44.9	42.8	34.6	31.5	12.0
EL	43.0	35.1	23.3	22.0	25.8	5.6
ES	50.7	48.8	32.8	34.6	36.3	11.3
FR	50.8	50.5	34.8	28.0	40.1	7.2
IE	48.7	46.2	35.2	26.0	28.6	7.3
IT	38.7	38.4	26.2	22.6	28.9	6.6
CY	42.5	41.6	31.1	21.8	33.8	6.9
LV	45.5	43.1	29.7	21.0	15.6	3.6
LT	45.9	43.0	31.8	24.6	20.3	4.9
LU	67.1	65.7	50.3	47.5	53.8	19.4
HU	51.8	52.2	45.0	29.9	35.7	8.7
NL	71.4	71.7	48.4	45.5	53.8	8.9
AT	64.9	63.0	49.7	40.6	41.7	11.7
PL	44.1	37.9	23.9	17.4	22.1	5.4
PT	41.0	38.3	32.0	26.2	25.4	6.4
SI	55.3	52.0	43.9	34.9	38.7	8.6
SK	60.9	55.2	45.0	24.7	28.5	6.3
FI	65.1	63.1	48.9	36.4	50.8	16.9
SE	73.4	73.1	54.6	36.5	56.0	13.1
UK	61.0	60.1	46.9	32.9	44.5	12.3
BG	28.2	25.3	18.3	11.2	9.1	2.4
IS	76.1	75.8	69.3	46.2	58.2	11.1
NO	61.6	72.0	59.7	46.1	63.4	16.8

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 7-2 Percent of *population* having carried out different internet related activities (2006)

	used a search engine to find information	sent an email with attached files	posted messages to chat rooms, newsgroups or an online discussion forum	used the Internet to make phone calls	have used peer-to-peer file sharing for exchanging movies, music, etc	have created a web page
EU25	53.9	45.1	18.8	9.0	10.9	9.2
EU15	55.5	47.0	18.4	8.5	10.8	9.5
NewMS	45.8	35.3	21.2	11.6	11.3	7.6
Eurozone	53.8	45.1	18.4	8.4	10.6	9.0
BE	61.1	52.1	17.9	9.1	8.9	7.4
CZ	42.9	40.8	14.1	9.6	3.9	6.6
DK	84.0	75.7	31.2	21.4	15.6	20.4
DE	69.9	55.3	25.7	10.9	7.5	8.9
EE	57.4	55.5	44.6	29.3	22.1	20.3
EL	34.7	22.0	9.2	3.8	5.3	4.4
ES	50.2	36.1	18.5	5.2	16.3	6.1
FR	46.9	43.7	8.5	4.9	:	11.9
IE	52.5	44.2	8.5	6.1	6.8	4.9
IT	36.0	34.0	20.7	9.3	10.2	7.2
CY	30.4	24.1	8.6	5.7	9.4	5.6
LV	51.1	37.5	20.1	13.7	9.4	5.1
LT	44.7	33.6	22.1	15.6	13.0	5.3
LU	70.1	63.3	30.6	17.8	17.7	14.2
HU	48.0	39.1	22.0	10.3	11.1	6.7
NL	80.3	73.2	21.8	13.5	19.2	15.7
AT	61.5	50.2	20.7	11.4	8.2	11.4
PL	43.7	30.2	22.9	12.2	13.1	7.7
PT	37.7	33.2	11.4	7.8	9.0	5.2
SI	53.9	44.2	21.4	7.7	15.5	10.2
SK	56.9	46.8	17.2	8.6	9.2	9.0
FI	76.2	62.0	26.3	17.4	15.3	17.3
SE	79.2	69.0	20.3	10.5	19.8	15.0
UK	58.5	51.8	16.6	8.1	9.9	10.2
BG	26.2	20.6	20.1	10.9	6.3	3.0
IS	84.2	74.3	35.3	26.7	23.4	28.4
NO	76.5	72.8	30.5	21.2	24.1	19.3

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

The following tables present the data behind Figure 4-1 and Figure 4-2.

Table 7-3 Variable interactions: Computer users having carried out different computer related activities by socio-demographic characteristics (2006)

	copied a file	used copy or cut and paste	used a spreadsheet	compressed files	connected/ installed new devices	written a computer programme
Age X education						
16-24, low	88.7	86.8	60.5	47.9	61.4	15.2
16-24, middle	92.0	90.3	71.5	56.1	68.4	22.3
16-24, high	97.4	97.5	79.7	68.7	79.2	24.7
25-54, low	66.4	62.6	37.9	31.3	47.6	5.9
25-54, middle	80.1	76.3	54.9	39.9	54.3	9.9
25-54, high	92.4	91.2	72.6	60.6	69.7	20.9
55-74, low	48.1	44.4	26.9	16.7	29.6	4.0
55-74, middle	64.9	62.0	41.4	24.3	40.4	7.0
55-74, high	78.7	76.5	52.5	37.9	54.5	13.6
Gender X age						
female 16-24	90.7	89.6	66.4	43.4	56.7	13.6
female 25-54	79.6	77.0	54.0	35.2	44.5	7.3
female 55-74	59.0	57.4	34.0	17.1	24.8	4.7
male 16-24	91.2	89.0	67.9	63.2	75.3	24.9
male 25-54	83.1	79.8	60.5	54.4	71.2	18.0
male 55_74	68.7	64.7	46.3	34.0	56.0	11.0
Gender X education						
female, low	68.3	65.9	43.2	26.0	36.8	6.7
female, middle	78.9	76.2	54.1	32.1	42.3	7.6
female, high	88.2	87.4	62.1	45.3	53.7	10.6
male, low	73.2	69.5	44.4	42.2	60.5	10.7
male, middle	81.7	77.9	58.6	49.8	68.1	16.5
male, high	92.0	90.2	76.2	67.7	80.4	28.4

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 7-4 Variable interactions: Internet users having carried out different internet related activities by socio-demographic characteristics (2006)

	used search engine	sent email with attachment	posted messages	used Internet to make phone calls	used peer-to-peer file sharing	created a web page
Age X education						
16-24, low	93.1	74.7	56.6	17.6	34.5	24.1
16-24, middle	93.8	82.6	57.2	20.2	35.6	23.1
16-24, high	98.8	93.0	44.4	20.8	40.6	29.5
25-54, low	84.4	63.4	20.8	10.3	13.0	10.0
25-54, middle	91.2	73.8	27.3	14.3	13.4	11.0
25-54, high	96.6	88.3	31.7	18.8	19.2	19.9
55-74, low	71.8	54.9	6.6	6.3	3.7	7.1
55-74, middle	84.2	64.4	11.0	9.2	4.1	6.8
55-74, high	90.7	77.5	15.0	12.4	6.4	11.3
Gender X age						
female 16-24	93.8	80.9	52.5	14.9	27.3	19.2
female 25-54	90.4	75.0	23.0	11.5	9.2	9.3
female 55-74	79.6	62.8	8.8	7.7	2.3	5.5
male 16-24	94.0	79.0	59.3	23.2	43.5	28.8
male 25-54	93.4	79.2	32.3	18.7	21.2	18.5
male 55_74	86.5	69.8	13.3	11.2	6.7	10.7
Gender X education						
female, low	84.8	66.7	33.0	10.3	16.4	13.9
female, middle	89.2	73.2	27.8	11.5	10.9	8.6
female, high	95.1	84.0	24.7	13.5	12.1	12.9
male, low	87.7	67.2	34.6	15.0	25.2	16.9
male, middle	92.7	76.0	36.4	18.4	23.2	17.7
male, high	96.4	89.4	34.4	21.9	23.5	24.8

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Unlike the data presented in chapter 4.4, these data refer to the basis of the computer users or internet users instead of total population.

Table 7-5 Percent of computer users having different levels of computer skills (2006)

	No skills (none out of 6 items)	Low skills (1-2 out of 6 items)	Medium skills (3-4 out of 6 items	High skills (5-6 out of 6 items
EU25	11.1	19.1	35.7	31.7
EU15	10.4	18.1	36.0	32.7
NewMS	15.4	25.2	33.9	25.3
BE	17.7	20.3	32.1	30.0
CZ	13.3	25.8	36.0	23.9
DK	10.4	14.8	33.7	41.1
DE	:	20.7	37.7	32.1
EE	22.4	14.2	26.7	36.7
EL	0.0	30.7	30.8	35.9
ES	10.5	17.2	33.7	38.5
FR	15.9	15.6	35.9	32.6
IE	22.8	19.6	14.4	27.9
IT	5.2	17.1	38.0	38.5
CY	8.2	18.2	35.9	37.5
LV	19.7	26.7	33.9	19.7
LT	10.1	21.9	37.8	30.1
LU	9.2	14.1	31.8	45.0
HU	5.4	16.8	35.3	42.6
NL	13.9	24.0	54.1	8.1
AT	11.0	15.6	32.3	41.1
PL	19.8	28.6	31.9	19.7
PT	13.8	16.5	27.8	41.9
SI	12.8	15.5	29.5	42.2
SK	9.7	25.1	41.3	23.5
FI	17.0	17.3	33.0	32.7
SE	13.4	18.9	35.4	32.2
UK	20.2	15.1	32.7	32.0
BG	17.4	30.5	35.9	16.3
IS	8.6	14.4	37.9	38.8
NO	11.5	18.1	30.3	40.2

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 7-6 Percent of internet users having different levels of internet skills (2006)

	No skills (none out of 6 items)	Low skills (1-2 out of 6 items)	Medium skills (3-4 out of 6 items	High skills (5-6 out of 6 items
EU25	4.2	51.9	33.0	9.8
EU15	4.4	52.5	32.7	9.1
NewMS	3.2	48.9	34.2	13.6
BE	5.1	58.3	29.3	6.9
CZ	4.7	58.8	28.2	7.6
DK	4.1	44.8	37.1	14.0
DE	:	56.0	34.1	6.7
EE	4.6	26.3	36.8	32.3
EL	0.0	64.7	27.0	7.7
ES	2.7	52.0	37.5	7.8
FR	:	:	:	:
IE	2.9	72.3	11.2	5.0
IT	0.9	38.1	42.0	18.3
CY	11.8	52.1	27.4	8.6
LV	5.6	51.5	31.3	11.6
LT	2.1	43.0	34.8	20.1
LU	1.5	42.7	41.7	14.1
HU	0.4	46.7	39.4	13.6
NL	2.7	52.2	34.4	10.5
AT	5.5	54.5	30.2	9.8
PL	3.5	46.5	35.1	14.9
PT	2.6	54.1	33.0	10.3
SI	3.7	47.9	34.2	14.1
SK	1.3	57.5	32.3	8.6
FI	6.3	47.9	33.6	12.2
SE	9.4	52.6	29.1	8.9
UK	14.3	53.3	24.9	7.6
BG	3.9	34.5	45.5	16.0
IS	3.7	38.1	39.7	18.1
NO	4.4	42.5	35.8	17.3

Source: Eurostat 2006 Community ICT Household survey (:) Data not available

Table 7-7 Calculation of ICT skills index and subindices

	copied or moved a file or folder	used copy or cut and paste tools	used basic arithmetic formulae in a spreadsheet	compressed files	connected and installed new devices, e.g. a printer or modem	written a computer programme	used a search engine to find information	sent an email with attached files	posted messages to chat rooms, newsgroups or forum	used the Internet to make phone calls	have created a web page	Used peer-to-peer file sharing for exchanging movies, music, etc	Ordered goods or services over the Internet last 3 months	Internet last 3 months for interaction with public authorities	Computer skills index	Internet skills index	Internet interaction index	Skills index
EU25	54.7	52.8	38.4	29.6	38.6	9.0	53.9	45.1	18.8	9.0	9.2	10.9	20.7	23.8	37.2	24.5	22.3	31.4
EU15	56.0	54.7	39.9	31.0	41.4	9.6	55.5	47.0	18.4	8.5	9.5	10.8	23.3	26.4	38.8	24.9	24.9	33.4
NewMS	47.5	43.1	30.9	22.3	24.6	5.8	45.8	35.3	21.2	11.6	7.6	11.3	7.3	12.9	29.0	22.1	10.1	21.7
Eurozone	54.3	52.9	37.8	30.2	40.1	8.9	53.8	45.1	18.4	8.4	9.0	10.6	20.2	26.9	37.4	24.2	23.5	31.7
BE	57.1	50.2	39.2	30.1	35.8	7.4	61.1	52.1	17.9	9.1	7.4	8.9	13.9	30.2	36.6	26.1	22.1	30.6
CZ	49.2	45.0	31.6	27.7	20.4	3.9	42.9	40.8	14.1	9.6	6.6	3.9	6.9	17.4	29.6	19.6	12.1	21.6
DK	78.6	75.0	65.0	44.7	57.8	19.4	84.0	75.7	31.2	21.4	20.4	15.6	30.6	43.2	56.7	41.4	36.9	50.1
DE	68.0	66.8	49.6	32.5	51.4	10.9	69.9	55.3	25.7	10.9	8.9	7.5	38.0	32.3	46.5	29.7	35.2	43.5
EE	46.7	44.9	42.8	34.6	31.5	12.0	57.4	55.5	44.6	29.3	20.3	22.1	4.5	28.6	35.4	38.2	16.5	30.8
EL	43.0	35.1	23.3	22.0	25.8	5.6	34.7	22.0	9.2	3.8	4.4	5.3	3.1	8.6	25.8	13.3	5.8	15.5
ES	50.7	48.8	32.8	34.6	36.3	11.3	50.2	36.1	18.5	5.2	6.1	16.3	10.1	24.7	35.8	22.1	17.4	26.8
FR	50.8	50.5	34.8	28.0	40.1	7.2	46.9	43.7	8.5	4.9	11.9	11.5*	18.5	21.3***	35.2	21.2	19.9	25.5
IE	48.7	46.2	35.2	26.0	28.6	7.3	52.5	44.2	8.5	6.1	4.9	6.8	21.3	25.7	32.0	20.5	23.5	28.9
IT	38.7	38.4	26.2	22.6	28.9	6.6	36.0	34.0	20.7	9.3	7.2	10.2	5.4	16.1	26.9	19.6	10.7	20.0
CY	42.5	41.6	31.1	21.8	33.8	6.9	30.4	24.1	8.6	5.7	5.6	9.4	5.0	12.7	29.6	14.0	8.8	18.3
LV	45.5	43.1	29.7	21.0	15.6	3.6	51.1	37.5	20.1	13.7	5.1	9.4	5.1	25.0	26.4	22.8	15.1	22.3
LT	45.9	43.0	31.8	24.6	20.3	4.9	44.7	33.6	22.1	15.6	5.3	13.0	2.5	12.7	28.4	22.4	7.6	19.9
LU	67.1	65.7	50.3	47.5	53.8	19.4	70.1	63.3	30.6	17.8	14.2	17.7	35.4	45.8	50.6	35.6	40.6	48.2
HU	51.8	52.2	45.0	29.9	35.7	8.7	48.0	39.1	22.0	10.3	6.7	11.1	5.0	16.8	37.2	22.9	10.9	24.5
NL	71.4	71.7	48.4	45.5	53.8	8.9	80.3	73.2	21.8	13.5	15.7	19.2	36.3	51.8	49.9	37.3	44.0	49.8
AT	64.9	63.0	49.7	40.6	41.7	11.7	61.5	50.2	20.7	11.4	11.4	8.2	23.3	33.0	45.3	27.2	28.1	37.4
PL	44.1	37.9	23.9	17.4	22.1	5.4	43.7	30.2	22.9	12.2	7.7	13.1	8.8	5.8	25.1	21.6	7.3	19.5
PT	41.0	38.3	32.0	26.2	25.4	6.4	37.7	33.2	11.4	7.8	5.2	9.0	4.7	16.5	28.2	17.4	10.6	19.5
SI	55.3	52.0	43.9	34.9	38.7	8.6	53.9	44.2	21.4	7.7	10.2	15.5	8.3	30.5	38.9	25.5	19.4	29.3
SK	60.9	55.2	45.0	24.7	28.5	6.3	56.9	46.8	17.2	8.6	9.0	9.2	6.8	32.2	36.8	24.6	19.5	28.1
FI	65.1	63.1	48.9	36.4	50.8	16.9	76.2	62.0	26.3	17.4	17.3	15.3	28.9	46.9	46.9	35.7	37.9	45.0
SE	73.4	73.1	54.6	36.5	56.0	13.1	79.2	69.0	20.3	10.5	15.0	19.8	39.4	51.7	51.1	35.6	45.6	50.7
UK	61.0	60.1	46.9	32.9	44.5	12.3	58.5	51.8	16.6	8.1	10.2	9.9	38.1	24.3**	43.0	25.9	31.2	39.7
BG	28.2	25.3	18.3	11.2	9.1	2.4	26.2	20.6	20.1	10.9	3.0	6.3	1.5	8.4	15.7	14.5	5.0	12.0
IS	76.1	75.8	69.3	46.2	58.2	11.1	84.2	74.3	35.3	26.7	28.4	23.4	31.4	60.6	56.1	45.4	46.0	54.4
NO	61.6	72.0	59.7	46.1	63.4	16.8	76.5	72.8	30.5	21.2	19.3	24.1	46.9	57.5	53.3	40.7	52.2	56.5

Source: Based on Eurostat 2006 Community ICT Household survey. *: imputed using OLS regression. ** Imputed using 2005 value. *** Imputed using EU25 ratio between sub-index components