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The growth of information and communication technologies (ICT) has had a dramatic impact on almost all sectors and occupations, fundamentally changing the face of the workplace. This report looks at computer use and training provisions in Europe. Information technology use and skills are seen as vital elements in achieving the European objective to become the most competitive knowledge-based economy in the world.

Introduction

Information and communication technologies now form an integral part of almost all sectors and areas of work. A holistic concept of work organisation, competence development, and employee participation is vital in successfully managing change and improving quality in work. Boosting the use of ICT, digital literacy and continuous upgrading of skills in the workforce are seen as crucial in achieving the objectives of the Lisbon strategy to become the most competitive knowledge-based economy in the world. Training and improving work-related IT skills are central elements of lifelong learning.

The focus of this report is on IT/computer usage at work within companies in all relevant sectors, and training measures that are being taken to strengthen performance. The use of a computer for work ranges from occasional to constant use. The tasks carried out vary from simple repetitive functions to complex tasks. In particular, difficult tasks in integrated systems require specialised training. For example, enterprise resource planning (ERP) and specific components, such as customer relationship management (CRM) or workflow methods, require more from users than just technical skills. This report can only give a general overview of the development and current state of ICT in the workplace, and learning and training measures.

This report is based on European level research, and analyses and contributions by national correspondents involved in the European Working Conditions Observatory. The availability of data based on national working condition surveys or other specific surveys on ICT varies among the countries. Some surveys referred to are several years old and therefore should be considered with caution. Due to the short life cycle of technologies and related skills, data become outdated and may not fully capture the current situation.

Computer use for work

Widespread use of ICT in Europe

The share of employees using computers for work varies considerably between the EU15 countries, according to Statistics on the information society provided by Eurostat.

Eurostat’s Statistics on the information society in Europe (1.9MB pdf) shows a levelling off in the percentage growth of the active population using a computer for professional purposes in the EU15. According to the data, the rate was 53% in 2001 and remained at the same level in 2002. 

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The analysis of the use of computers at work differentiates between the general figures on IT penetration of workplaces and the extent of using computers in relation to working time.

The [European Working Conditions Surveys](http://example.com) examine the intensity of computer use. The third survey from 2000 covering the EU15 shows a higher degree of computer use for work (Figure 2) than the data of the first survey for the acceding and candidate countries (Figure 3).
Regarding the penetration of computers used for work, data from the European Working Conditions Survey 2000 - for those using a computer at least one quarter of their working time - show an increase in the proportion of people working with computers (at least occasionally) from 39% in 1995 to 41% in 2000.

Eurobarometer surveys on ‘ICT and work’ confirm a widespread use of IT in working life in the EU15. More than 50% of EU15 employees use a computer for work. Use of IT differs between occupational groups.

In contrast to the data from the third European Working Conditions Survey in 2000, which show little or no
increase in computer use among blue-collar workers, the Eurobarometer surveys indicate the highest increase between 2000 and 2002 for this group. The increase is also very high for self-employed workers.

<table>
<thead>
<tr>
<th>Table 1 Increase in computer use for work between 2000 and 2002 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average EU workers</td>
</tr>
<tr>
<td>Managers</td>
</tr>
<tr>
<td>Other white collar</td>
</tr>
<tr>
<td>Self-employed</td>
</tr>
<tr>
<td>Manual workers</td>
</tr>
</tbody>
</table>


The proportion of blue-collar workers using a computer for work differs according to company size. In large companies, 51% of the workers use a computer, compared with 29% in small companies and 22% in micro firms.

In general, the data show an equal proportion of around 53% for women and for men using a computer for work. There are considerable differences regarding educational level. 76% of people with high education, compared with 22% of people with low education, use a computer for work.

There has been some research into the question of whether the labour market position of older workers is affected by new technologies. The findings do not seem to fit neatly into the perception that older workers have lower abilities and/or incentives to acquire new skills. Borghans and ter Weel (2002), analysing UK data, found that older workers have lower computer skills than younger workers, but the main distinctions lie between the 20-29 year-old workers and the others. Their analysis did not support the concern about older workers not being able to cope with computers. Friedberg (2003) found evidence in the US that impending retirement rather than age alone explains why older workers used computers less than their prime-age co-workers. A second finding was that computer users choose to retire later than non-users. Based on data from the German Socio-Economic Panel, Schleife (295Kb pdf, 2004) found that factors other than computer use determine if workers voluntarily or involuntarily change their employment status and become part-time workers, retired or unemployed.

The sector (Table 2) and the company size (Table 3) strongly determine the extent of ICT use. This is also reflected in national working conditions surveys.

<table>
<thead>
<tr>
<th>Table 2 Percentage of employees using computers in the EU15, by sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Manufacturing</td>
</tr>
<tr>
<td>Wholesale and retail</td>
</tr>
<tr>
<td>Hotel and restaurant</td>
</tr>
<tr>
<td>Transport and communication</td>
</tr>
<tr>
<td>Real estate</td>
</tr>
</tbody>
</table>

Source: Eurostat, eCommerce and the Internet, 2003

<table>
<thead>
<tr>
<th>Table 3 Computer use in the EU15, by company size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company size</td>
</tr>
</tbody>
</table>

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### National data on IT penetration in the workplace

Based on the statistical programme of the EU, Member States were requested to provide data on ICT in companies. National data provided for this programme and national working conditions surveys show a high degree of ICT use at the workplace and an immense increase over the last three decades, both regarding the diffusion and the intensity of use.

### Table 4 Use of ICT/computers for work

<table>
<thead>
<tr>
<th>People working with a computer</th>
<th>Frequency of use</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1999 share of working time: more than 3/4: 18% up to half: 41%</td>
<td>Statistics Denmark (DST); Danish National Institute of Occupational Health (AMI)</td>
</tr>
<tr>
<td>Finland</td>
<td>Women use computers more intensively than men</td>
<td>Finnish Quality of Life Survey</td>
</tr>
<tr>
<td>France</td>
<td>2002: 65%; administrative, financial and commercial departments: over 90%; production departments: 37%</td>
<td>Not given</td>
</tr>
<tr>
<td>Germany</td>
<td>companies with 10 and more employees: 96%; all companies: 80%</td>
<td>Federal Statistical Office Survey 2003</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1996 52% 70%</td>
<td>Central Bureau of Statistics</td>
</tr>
<tr>
<td>Spain</td>
<td>PCs connected to the Internet: 29.1% at least once a week: 47.8%</td>
<td>Survey on ICT 2002</td>
</tr>
<tr>
<td>Sweden</td>
<td>1989 29.6%</td>
<td>Work Environment Survey (AMU)</td>
</tr>
<tr>
<td></td>
<td>2001 64.7%</td>
<td></td>
</tr>
</tbody>
</table>

Source: EWCO national correspondents

### Gender

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As has been noted, European survey data give evidence of an almost equal use of IT by women and men in terms of quantity. However, these data do not differentiate regarding the actual use of ICT beyond the general figures. Some of the national surveys capture gender differences in computer use (Table 5). These differences are closely interrelated with the persistent horizontal and vertical gender segregation that exists.

The new technology does not appear to have a positive impact on reducing gender segregation. Women and men use computers in their specific areas of work and this implies a different use of computers. Across countries, women use computers more intensively than men.

One example that throws some light on the use of computers by women and men is based on the German BIBB/IAB survey (1988/9). Although women and men use computers to an almost equal extent, women more often use the computer predominantly, and there is a gender differentiation in use of particular hardware and software. For instance, at the time the survey was carried out, 11.2% of men compared with just 3.4% of women used laptop computers in Germany, while 32% of men, compared with 18% of women, used graphic software packages.

The Finnish Quality of Life Surveys show a clear upwards change in the educational level of female computer users at work. In 1984, 14% of women using computers had third level education (26% of men). By 2003, this figure for women had risen to 53% (42% for men).

<table>
<thead>
<tr>
<th>Table 5 Computer use by gender (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working with ICT</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Denmark</td>
</tr>
<tr>
<td>Denmark</td>
</tr>
<tr>
<td>Working with ICT</td>
</tr>
<tr>
<td>More than 3/4 of WT</td>
</tr>
<tr>
<td>Less than 1/2</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>62</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>56</td>
</tr>
<tr>
<td>Finland</td>
</tr>
<tr>
<td>Finland</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>1984</td>
</tr>
<tr>
<td>49</td>
</tr>
<tr>
<td>1990</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>1997</td>
</tr>
<tr>
<td>58</td>
</tr>
<tr>
<td>2003</td>
</tr>
<tr>
<td>59</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Diffusion</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>39</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>34</td>
</tr>
<tr>
<td>Netherlands</td>
</tr>
<tr>
<td>Netherlands</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>1989</td>
</tr>
<tr>
<td>28.1</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>31.4</td>
</tr>
</tbody>
</table>

Source: EWCO national correspondents

Qualification and occupational status

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The national data show that, across the countries, computer use is closely linked with qualification level and occupational status. The penetration of ICT and its growth over the last decades is greatest for the most qualified groups. Blue-collar workers, and particularly unskilled blue-collar workers, use computers less often.

The German BIBB/IAB surveys provide detailed data on ‘diffusion’ and ‘predominant’ use according to occupations. The data indicate that the diffusion is much greater for those with higher qualifications.

The findings of the BIBB/IAB survey show that hardly any occupation is unaffected by computer use, and that it has increased considerably across all occupations (Troll, 2000c).

Age

Computer use is highest for the middle-aged groups and is lower among older workers.

**Table 6 Age and computer use (%)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Age group</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>18-33</td>
<td>62</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>34-45</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>45-59</td>
<td>59</td>
<td>58</td>
</tr>
<tr>
<td>Finland</td>
<td>15-24</td>
<td>68</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>25-34</td>
<td>80</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>35-44</td>
<td>78</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>45-54</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>55-64</td>
<td>68</td>
<td>65</td>
</tr>
<tr>
<td>Germany</td>
<td>Less than 30</td>
<td>35</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>30-44</td>
<td>38</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>45 and more</td>
<td>34</td>
<td>59</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Same percentage for all groups except users aged 25-45 years who experience more frequent and intensive use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>19-64</td>
<td>47.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25-34</td>
<td>70.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35-44</td>
<td>68.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-54</td>
<td>66.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55-64</td>
<td>62.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: EWCO national correspondents

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Employment status

Data on computer use and employment status are only available for the Netherlands. The proportion using a computer is higher among permanent and full-time employees.

<table>
<thead>
<tr>
<th>Table 7 Computer use and employment status, Netherlands (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>2000</td>
</tr>
<tr>
<td>2002</td>
</tr>
</tbody>
</table>

Source: TAS - TNO Work Situation Survey

IT training

Occupational training and lifelong learning

IT skills and competence development are vital factors for the labour market position and career development of employees, and the competitiveness of companies. Continuous learning is essential with regard to the rapid development of ICT.

'The Eurostat structural indicator on 'lifelong learning' reflects an increase this regard and in particular a higher rate of female employees than male employees in such measures.'

The Commission’s Communication Improving quality in work: a review of recent progress (242Kb pdf) emphasises that ensuring basic IT skills should become an integral part of enhancing employability; lack of IT literacy represents a fundamental barrier to employment. At the same time, the Communication states that more than half of European employees have no access to training at the workplace nor participation in any training programmes.

'The European Working Conditions Survey 2000 shows a slight increase in company-provided training of employees from 29% to 31%, with an average duration of 4.4 days per person. The data also indicate a decrease in inequalities in training based on type of employment contract. However, the data do not differentiate between IT-related training and non-IT related training.'

'Looking at the national working conditions survey data, the assumption is that IT-related training would show a stronger growth than other occupational training, and account for a rising proportion of company training costs.' The analysis differentiates between skill requirements and skills actually acquired through training and education.

Identification of IT skills

Several degrees of IT skills can be distinguished:

- basic digital literacy;
- user skills;
- professional skills.

This report looks primarily at user skills as defined by the ICT skills monitoring group in the final report on eBusiness and ICT skills in Europe (266Kb pdf). User skills are understood as the ability to use or apply ICT tools in general workplace situations not related to the ICT sector. The rapid spread of ICT and the resulting re-engineering of business processes fuel the demand for such skills.

Beyond the basic skills, it is difficult to classify more specific ICT skills at the workplace as these are complex and
closely bound to hardware and software applications and functions. They range from technical skills to comprehensive and contextualised user skills, including work process knowledge, commercial knowledge, knowledge of product and service needs, etc.

**Task requirements**

An analysis of workplace computerisation and occupational skill requirements shows evidence of educational upgrading, increased demand for analytical and interactive activities, and the spread of computer technologies in recent decades. Based on the four German BIBB/IAB surveys, the research indicates that IT increases the demand for employees with high levels of education. Computer technology is replacing workers in performing manual and cognitive routine tasks, whereas it complements workers in performing non-routine cognitive tasks. The results show that those occupations experiencing greater computerisation witnessed significantly larger increases in analytical and interactive task requirements, and greater declines in manual and routine cognitive tasks (Spitz, 2004).

These findings confirm results of a previous study in the UK that identified ICT as a key driver of upgrading skills, increases in cognitive skills and decreases in motor skills.

**Shorter skills lifecycles**

The pace of ICT innovations accelerates the lifecycle of skills. Innovations in hardware and software mean new skill requirements. It is important to avoid a mismatch between the demand and supply of IT-related skills.

The complex relationship between ICT and work organisation impacts on the speed with which specific skills requirements develop, the way skills are acquired, and the pace at which they become outdated again (Empirica, 2003).

**Acquiring skills**

**Forms of IT training and learning**

IT training should cover both technical skills and competencies in application. This second aspect requires a broader understanding of IT training.

IT training can take place:

- within basic vocational education;
- within vocational further training;
- in specific training courses;
- by learning on the job.

In contrast to traditional models of occupational training, the acquisition of skills increasingly takes place throughout working life.

Available data on IT skills mainly concern the ICT sector, whereas the provision of IT skills in non-IT occupations has rarely been analysed, and data are not available even at national level (Empirica, 2003).

Training and learning taking place in non-formal and informal settings is more difficult to measure. Empirica outlines that results from the SIBIS (Statistical indicators benchmarking the information society) pilot survey suggest that the extent to which lifelong learning is practised is underestimated by the Labour Force Survey data. In this survey, the EU labour force was asked whether they participated in work-related training provided by their employer or another organisation, or practised self-directed learning related to their work. (Empirica, 2003)

SIBIS defines ‘self-directed learning’ as voluntary learning by individuals based on self-motivation. Self-directed learning is an important means of acquiring work-related skills. In most countries, a significantly higher proportion of people engage themselves in work-related self-directed learning than in training provided by outside

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organisations. It is most common in Germany.

**Figure 5 Lifelong learning and self-directed learning**

![Diagram showing the degree of labour force participation in lifelong learning based on the SIBIS survey and the extent of self-directed learning.](diagram)

Figure 5 illustrates the degree of labour force participation in lifelong learning based on the SIBIS survey and the extent of self-directed learning.

The widespread informal IT training activities are hard to provide data for and hardest to pin down. Work-related IT skills rather than traditional skills are more likely to be taught informally (Empirica, 2003).

Based on the SIBIS data, Empirica expects that the skills gap between the current workforce and unemployed people will widen because of the extent to which people in employment are engaged in company-provided training, learning by doing and self-directed learning (Empirica, 2003).

**Development of IT training in Europe**

**Decline of IT training**

Figure 6 shows the degree of computer training at the workplace for employees concerned by ICT. In the EU15, there was a decline in training from 2001 to 2002.
The *Europe 2002 Final Report (264Kb pdf)* states that, in relation to digital literacy of the labour force, the proportion of the working population receiving computer training increased from 23% to 29% between 2000 and 2001 but remained static in 2002. The report underlines the need for more computer training as, in all Member States, the proportion of the working population using computers at work was far higher than the proportion being trained.

Data from the Eurobarometer surveys signal that the proportion of the workforce that have received computer training is decreasing (Table 8). The data indicate a decline in all forms of skills attainment.

**Table 8 Computer training (% of EU workforce**)**

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever had computer training</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Paid by the employer*</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>During working hours*</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>At the workplace*</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>During last 12 months*</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: SEC(2003) 652 and SEC(2002) 372; based on Eurobarometer data. *Refers to the most recent training **Sample excludes unemployed people and workers who may have had training but did not use computer

The proportion of the active population using a computer for work that had computer training at the workplace decreased from 54% in the year 2001 to 49% in the year 2002. Swedish Labour Force Survey data also give evidence of a decrease in IT training between 1999 and 2003. In the Netherlands, survey data illustrate that the percentage of workers receiving IT training decreased across sectors and at all occupational levels.

This development runs parallel to changes in IT expenditure in the EU15. Eurostat *structural indicators* show a decline in expenditure for IT hardware, equipment, software and other services as a percentage of GDP. In the new Member States, IT expenditure is lower but still increasing.
Table 9 IT expenditure (% of GDP)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU15</td>
<td>3.3</td>
<td>3.2</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>NMS</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: Eurostat, Structural indicator

There might be a number of explanations for this trend in the EU15 such as reducing costs, economic recession, relative saturation in supply of computers for work, outsourcing, and increasing standardisation of IT applications.

Regarding IT training, cost reductions may have concerned, in particular, expensive training courses outside the company. According to the latest European eBusiness Report (3MB pdf), the survey in 2002 highlighted that companies, although supportive in developing the IT skills of their employees, clearly consider ‘learning on the job’ as the most important way to improve the IT skills base in the company. Only about half as many companies regard formal training schemes as very important.

Table 10 Company support for employee training, in five EU countries

<table>
<thead>
<tr>
<th></th>
<th>Support of any IT training measure</th>
<th>In-house computer/IT training</th>
<th>Training by third parties</th>
<th>Use of working time for learning activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By country</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>76</td>
<td>44</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Spain</td>
<td>62</td>
<td>15</td>
<td>42</td>
<td>49</td>
</tr>
<tr>
<td>France</td>
<td>73</td>
<td>48</td>
<td>48</td>
<td>63</td>
</tr>
<tr>
<td>Italy</td>
<td>69</td>
<td>40</td>
<td>46</td>
<td>62</td>
</tr>
<tr>
<td>UK</td>
<td>81</td>
<td>51</td>
<td>56</td>
<td>71</td>
</tr>
<tr>
<td><strong>By sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food, beverages and tobacco</td>
<td>67</td>
<td>32</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>Chemical industries</td>
<td>86</td>
<td>56</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Electrical machinery and electronics</td>
<td>93</td>
<td>65</td>
<td>64</td>
<td>71</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>93</td>
<td>58</td>
<td>84</td>
<td>73</td>
</tr>
<tr>
<td>Retail</td>
<td>62</td>
<td>29</td>
<td>35</td>
<td>47</td>
</tr>
<tr>
<td>Tourism</td>
<td>68</td>
<td>33</td>
<td>41</td>
<td>56</td>
</tr>
<tr>
<td>ICT services</td>
<td>94</td>
<td>73</td>
<td>74</td>
<td>91</td>
</tr>
<tr>
<td><strong>By company size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-49 employees</td>
<td>53</td>
<td>21</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>50-249 employees</td>
<td>86</td>
<td>51</td>
<td>58</td>
<td>69</td>
</tr>
<tr>
<td>250+ employees</td>
<td>93</td>
<td>63</td>
<td>73</td>
<td>70</td>
</tr>
</tbody>
</table>

Source: e-Business W@tch (2003)
Figure 7 illustrates the characteristics of computer training for those employees who received such measures.

**Figure 7 Characteristics of computer training in the EU, 2002 (%)**

- Made the job easier: 85%
- Was paid by the employer: 76%
- Was organised during working hours: 68%
- Was done at the workplace: 59%
- Was done during the previous 12 months: 36%

Source: Information society statistics, 1997-2002, Eurobarometer

National data on IT training

National working conditions surveys in Finland, the Netherlands and Sweden provide some data on IT training.

The middle age groups tend to receive more IT training than younger and older workers in the Netherlands and in Sweden. In Finland, computer users in the 55-64 age group receive more training than all other groups. In total, and across all age groups, women receive more IT training in Finland while, in Sweden and the Netherlands, there is an almost equal participation of women and men.

In the Netherlands and Finland, the incidence of IT training rises with education level. In Finland, the proportion of employees receiving IT training is higher for women than for men at all levels.

Data (TAS) in the Netherlands show that employees with permanent contracts receive more training than temporary workers. Full-time employees receive more training than part-time workers, with the exception of professionals and administrative employees.

In Spanish companies using computers, the percentage of employees being trained is highest in larger companies (SEDIS/DMR).

**Work organisation and training**

There is a strong interrelation between changes in work organisation and computer use. Enhancing productivity growth by introducing or adapting the use of IT can only be achieved in combination with company reorganisation. This requires general IT user skills and competence development at all levels.

The Commission Staff Working Paper *Building the knowledge society: Social and human capital interactions* (648Kb pdf) (SEC(2003) 652) was developed with the support of the high level group *Employment and social dimension of the information society (ESDIS)*. It emphasises that the current level of digital training and ICT has
not yet, it would seem, reached its full potential. The paper discusses the context of introducing ICT, training measures, and the effects on working life. The data show some improvement in the context of introducing ICT. However, only 50% of European workers report appropriate technical training. The paper argues that:

'One weak aspect of the introduction of ICT in European organisations is the lack of training for new roles, which was provided only to one worker out of three. This kind of training is key for working in the knowledge society, where 'soft skills' are even more important than technical training.'

Regarding quality in work, the data on EU workers’ perception of introducing ICT provide interesting insights. In 2002, the majority of employees experienced significant organisational changes, reported an improved job quality, found work organisation more efficient, stated that actual needs were met, and received appropriate technical training. However, only one third had been trained in new roles/tasks, and less than half had been consulted. The already low rate of more comprehensive training in new roles and tasks actually decreased. This requires attention with regard to improving both quality of work and enhancing productivity and efficiency at work.

Figure 8 EU workers' perception of ICT introduction

![Figure 8 EU workers' perception of ICT introduction](image)

Figure 9 indicates that the majority of computer users feel that ICT makes their jobs easier. At the same time, the demands of work and of qualifications increased.
Survey data underline that productivity gains from ICT are significantly higher if combined with appropriate training. The Commission’s staff working paper stresses that, in terms of job quality and productivity, the vast majority of European companies do not seem to exploit sufficiently the potential of ICT. The paper recommends the provision of contextual skills and that ICT training should be integrated in a multi-skilling strategy. (SEC(2002) 372)

The introduction of ICT is perceived by the workers as more satisfactory, in terms of higher job quality, if it is included within complementary measures, specifically organisational change at the workplace.
The 1997 and 2003 Finnish Quality of Life survey included questions on whether employees felt they received sufficient guidance in IT in new and difficult situations. The detailed data indicate that around one third of computer users in 1997 received insufficient guidance. This proportion declined according to the 2003 data both overall and across different groups of employees.

IT skills are closely related to the particular job and often company specific. Developments in IT use and application such as standardising IT systems in groups of companies and the dominance of certain software systems can be advantageous for employees, as this could imply a cross-company use of IT skills, enhancing mobility and employability.

A central question is the potential correlation between IT skills and levels of job control or autonomy. In the context of introducing or reorganising IT systems, the involvement of the users and the consideration of their needs is an indicator for quality in work.

The European Working Conditions Survey gives some evidence of a link between increasing work intensity and increased computer use over the last decade. In the 2000 survey, those who report using computers at work are more likely to report having to work to tight deadlines.

Figure 11 illustrates the perceived quality of work changes from using a computer, based on Eurobarometer data from 2001.
The national data reflect a gap in more qualitative research of the context of IT and work organisation. There is no systematic research or national survey on the following issues:

- incidence of IT training and reorganisation;
- correlation between levels of job control/autonomy and IT skills;
- general skills upgrading of the workforce, or evidence of a new digital divide;
- appropriateness of training provision to meet the needs of computer users;
- impact on the quality of jobs;
- potential risks in the context of IT use and an intensification of work.

The German Centre for European Economic Research ZEW has launched a research project on use of ICT and reorganisation.

In Denmark, potential physical risks in the context of IT use and an intensification of work have been analysed.

A study in Spain focused on potential risks in the context of ICT use in the workplace (Zimmermann, 2001). It outlined eyesight problems as part of the emerging professional diseases caused by the use of new technologies.

Two Dutch surveys indicate a positive correlation between levels of job autonomy and IT skills. (Flexibility and work, 1999; Work in the information society, 2002)

The Swedish Work Environment Survey reveals that the opportunities of influencing one’s own work have decreased for all socio-economic groups and skill levels.

In France, nearly 52% of companies used integrated management software (PGI or ERP) in 2002, compared with 37% in 1999. According to the Dauphine-Cegos eManagement Observatory 2002 Survey, it appears that the introduction and use of ICT led to a reduction in the number of hierarchical levels in 27% of companies.

In the Netherlands, two surveys show a contradictory impact on work intensity. In the 1998 Flexibility and Work Survey, no link between work pace and computer use was detected, whereas the 2002 Work and Information Society survey identifies a correlation.

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Impact for quality in work and employment and working conditions

From a perspective of quality in work, the issue of IT use and training covers a number of aspects of employment and working conditions:

- skills development;
- career development and mobility;
- continuous training - lifelong learning;
- employability;
- work organisation;
- job content, job control, job autonomy;
- workers’ participation;
- health and safety;
- work-life balance.

Digital literacy and basic or more comprehensive IT skills play a key role in entering or staying in the labour market. Therefore, training measures are important, particularly for women and men after parental leave or other career breaks, older workers, employees with fixed-term contracts, or temporary agency workers.

Investigating the use of computers for work and IT training demands a more detailed perspective due to the broad range of functions and skills required. One example is a potential gender divide. The data from national working conditions surveys show that the work context is a key question in computer use. This can range from routine low paid jobs to highly qualified computer science work.

Similarly, the provision of training, the attainment of skills, and participating in implementation and reorganisation processes have the potential both to diminish barriers and to create new divides in the labour market. The widespread tendency towards outsourcing of IT-related functions is a further issue that has an impact on working and employment conditions.

The Commission’s Staff working paper (SEC(2002) 372) implicitly takes up the question of whether IT implementation improves inclusion and job quality, or has negatives impacts for working conditions (Krenn, Flecker, and Stary, 2003). The paper argues that the increase in jobs requiring high training and autonomy seems to be offset by an opposite effect of more repetitive tasks and poorer work content, as well as greater work intensification and more sophisticated controls over one’s work. The paper anticipates that there will be a polarisation of the workforce into those enjoying relatively stable and skilled work, and a group of low-skilled, temporary workers in atypical forms of employment.

A gap may emerge between employed and unemployed people, as IT skills are strongly related to work experience and learning on the job. Unemployed people are excluded from this kind of learning. In this context, inclusiveness gains a further crucial dimension.

According to the Eurobarometer data, computer users strongly recognise the importance of new technologies in their work, although this percentage decreased from 92% to 82%. The importance of ICT in doing, getting and keeping a job is underlined by a high percentage of the workforce.

On the one hand, ICT can reduce work burdens. The Eurobarometer data show that the majority of workers believe that ICT ‘made their job easier’. On the other hand, there is increasing evidence of serious new health and safety risks relating to ICT work. The Commission’s Staff working paper (SEC(2002) 372) discusses a number of risk factors:

- stress symptoms due to excessive working hours, workload and increasing complexity of tasks;
- negative side-effects in the form of information overload through email, difficulty in distinguishing significant and insignificant information, and being accessible all the time;
- stress of having constantly to upgrade skills;
- decrease in human relationships replaced by virtual contacts;
- physical impairments such as repetitive strain injuries and musculo-skeletal illnesses due to inadequate or ergonomically unadapted equipment or to forced postures, and the combined effects of both.

A further risk factor is insufficient or inappropriate training of the workforce.
In its report from November 2003, the Employment Taskforce calls for a more widespread use of ICT by making it more accessible and increasing training at all levels.

In its conclusions on ICT and eBusiness skills in Europe (112Kb pdf), the Council encouraged Member States to promote lifelong learning in cooperation with industry. This will help in achieving new jobs and a continuous upgrading of skills, and will intensify efforts for training and improving skills for all age groups, genders, etc. The Council also encourages industry and the social partners to define and communicate the IT job profiles needed in the various business sectors and company sizes, to promote a common classification of IT skills, to facilitate lifelong learning of the labour force, and to improve the inclusion of the entire labour pool.

Important policy means are the Commission’s action plan on skills and mobility (700Kb pdf) and the Communication on its implementation (3.5MB pdf), as well as a number of EU policy initiatives aimed at the knowledge society and information society.

In contrast to previous years, the Employment guidelines 2003 (196Kb pdf) do not specifically address IT skills and training.

At the meeting in June 2003, the Employment and Social Affairs Council concluded the Council Resolution on building social and human capital in the knowledge society: learning, work, social cohesion and gender (96Kb pdf). This resolution emphasises the need to address the current gender gaps in access to ICT-related education, jobs and the use of ICT, and to exploit the potential offered by ICTs for the creation of new job opportunities, especially through e-working. A further resolution at the November 2003 Competitive Council meeting, Equal access to and participation of women and men in the knowledge society for growth and innovation (150Kb pdf), emphasises the need to provide the workforce with the key skills required for the knowledge-based economy. It particularly underlines the need for greater efforts in policies and initiatives addressing the current gender gap and providing equal access to training. The resolution also encourages the Member States to develop, collect and publish statistics separated according to gender.

The European social partners have concluded a Framework of actions for the lifelong development of competencies and qualifications. This joint agreement deals in detail with the detection of the needs and measures to develop occupational competencies and qualifications. The framework includes plans for annual reports and a monitoring clause.

The European Computer Driving Licence (ECDL) is an international initiative to achieve a classification and certification of IT-related skills and qualifications.

'To valorise training efforts in the labour market, ICT courses offered by employers and by all kinds of public and private vocational training should be linked to widely recognised ICT skills accreditation. In this respect, ESDIS [the high level group Employment and social dimension of the information society] recalls its recommendation to recognise the European Computer Driving Licence (ECDL) as a Europe-wide accreditation scheme without prejudice to either existing national schemes or the possibility of including other schemes.' (SEC(2002) 372)

The eEurope initiative was launched to support the Lisbon strategy. Ahead of the spring European Council in 2005, the Commission will submit a strategic analysis of ICT support to the Lisbon Strategy (COM(2004) 380 final - 229Kb pdf).

The PERINE Internet portal offers links to sources on education and training. The e-learning portal is a further source for information.

Future data provision and analysis based on the Regulation on Community statistics on the information society (90Kb pdf) will give information on ICT systems and their use in companies, ICT competence and the demand for ICT skills.
Policies at national level

At European level, the social partners deal with lifelong developments of competencies and qualifications, and monitor national developments in follow-up reports. It appears that most of the actions taken at national level are of a more general nature in fostering IT use and skills. Specific work-related measures often target unemployed people.

Action programmes

Some countries have set up action programmes relating to work and the information society, though, in Denmark, an action plan does not specifically aim at IT skills in relation to work.

The action programme Information Society Germany 2006 (1.2MB pdf) covers a range of measures aimed at fostering ICT use and training. Key objectives regarding training are:

- the spread of new media in schools, vocational training institutions and universities;
- establishing a network of excellence and a technical grid infrastructure for German research and business;
- increasing the proportion of women in IT training and computer courses to 40% by 2006.

The Forintel programme was launched in August 2001 by the Spanish Ministry of Science and Technology within the framework of the operative programme on entrepreneurship and continuing training by the European Social Fund. Its main goals include:

- ongoing adaptation and development of both workers and their job content;
- improved competencies and qualifications of workers across all sectors.

These goals are pursued through ICT training, placing a special emphasis on working women and employees in small and medium-sized enterprises. Forintel aims to:

- foster training activities in order to facilitate and increase ICT use;
- accelerate worker access to the information society, focusing particularly on certain groups;
- support ICT use in business processes.

The Tripartite Foundation for Training in the Workplace offers a large number of courses on ICT-related topics. Data on these activities are not available.

In the Netherlands, teleworking can be used as a rehabilitation tool. When an employer uses teleworking to employ a person with a disability or to prevent long-term sick leave, the extra costs are compensated under legislation for the rehabilitation of disabled people (REA). The programme Pc-privé allows employers to pay their employees a maximum of €1,415 free from taxes to buy a computer.

In Sweden, an IT commission surveys qualification needs.

Identifying key competencies and skills

- Within an initiative of the German Federal Ministry of Education and Research, the research network for early identification of qualification needs investigates emerging qualification needs and assesses them with regard to future development. One example is a project on early recognition of qualification needs in areas where there has been a rapid spread of ICT. Another project (Gensicke/Kuwan, 2004) deals with the impact of ICT in business administration.

Classifying IT skills or skills frameworks

- None of the EWCO national correspondents reported any classification initiatives on users’ IT skills. Cert-IT is a joint social partners’ platform in the German IT sector. A joint Internet portal of IG Metall and the business organisation BITCOM supports implementation of new education and training provisions.

Action plans and best practice examples

In Germany, some initiatives are supported by ministries: the Women in the Information Society and Technology
The Dutch government initiative ‘digital playground’ establishes places in disadvantaged neighbourhoods where people can learn to use ICT. The target groups are people who do not have access to ICT via work or education, such as women, elderly people, unemployed people and immigrants. The programme’s objectives are to reduce the digital divide, to improve the participants’ labour market position by developing specific ICT skills, and to reinforce social cohesion between the different participating groups.

**Women on the web** is a Dutch network for women on the Internet. **Seniorweb** provides computer and Internet training by and for older people.

**Commentary**

In view of the far-reaching targets of EU policies, attention should be paid to the fact that the extent of IT training seems to be declining. As there is evidence ([UK02010S](http://www.eurofound.europa.eu/Publications/htmlfiles/ef0405.htm)) of a positive correlation between ICT-induced skills changes and productivity growth, comprehensive strategies to foster appropriate skills acquisition must be developed.

In surveys, too much emphasis is placed on technical ICT application, while the focus on IT training is too general. Researching IT in the context of the work situation shifts the emphasis of training to looking at an essential competence development and multi-skilling strategy. Work in most activities is imbued by IT both in a technical sense and in an application sense. The application encompasses IT implementation and the restructuring of work processes.

In analyses on IT and in considering the impact of IT in working condition surveys, the quantitative penetration of computers in the workplace is dealt with from a perspective that sees IT as an external tool impacting on the work situation. A comprehensive perspective, considering IT as an integral aspect of a general transformation of work, is more appropriate.

Some survey data (Eurobarometer, French eManagement Observatory 2002 Survey) indicate an improvement in the quality of work. However, there are no clear definitions of quality of work, nor of indicators used. Therefore, the survey results remain diffuse and further investigation is required.

Future research and data compilation should look beyond mere access to and use of electronic equipment, in particular computer and Internet use. Studies and surveys should investigate:

- the impact on the nature of work;
- tasks carried out with computers and how they vary according to occupation;
- early identification of qualification needs instead of retrospective research;
- how to avoid a mismatch between skills demands and supply of IT-related skills;
- the quality and appropriateness of training;
- the impact of different forms of training and of different training objectives;
- measures to avoid a potential digital divide in the work force and social exclusion;
- the impact of an increasing virtualisation of work.

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Appendix: Surveys and methodology

EU level

European Working Conditions Surveys

European Foundation for the Improvement of Living and Working Conditions Surveys: 1990/1, 1995/6 and 2000 in the EU15

2001/2 in the then acceding and candidate countries

Survey 2000: interviews with over 21,500 workers (1,500 in each Member State, except Luxembourg: 500). Questionnaire-based, comprising over 80 questions in face-to-face interviews conducted outside the workplace

Survey 2001/2: a total of 11,000 workers were interviewed

Eurobarometer surveys

Les Européens et les technologies de l’information et de la communication dans le cadre de l’emploi

2000: Eurobarometer 54.0

2001: Eurobarometer 56.0

2002: Eurobarometer 58.0

Survey on ICT use in companies 2002, Eurostat

2002 - 61,055 companies

2003 - 66,162 companies

were surveyed in participating Member States

Size coverage: companies with 10 persons employed or more

General Population Survey (GPS)

INRA Deutschland GmbH

11,832 interviews, computer-aided telephone interviews in private households in the EU15

Continuing vocational training survey (CVTS) 2000, Eurostat

European e-Business Decision-makers Surveys

e-Business W@tch

Two surveys June 2002 and March 2003

Seven sectors, five countries, all company sizes. N=3,515 companies
Survey on ICT use and eCommerce, Eurostat and Member States

Eurostat developed the model questionnaire in cooperation with Member States and OECD.

The surveys were carried out during the first half of 2002, except in Denmark where it was carried out at the end of 2001 and in France towards the end of 2002. The reference period for all variables was generally 2001 except for some of the key ICT usage questions which looked at the situation at the beginning of 2002.

Denmark

*IT use and the population* - 2003  (in Danish: Befolkningens brug af IT), published by Statistics Denmark (Danmarks Statistik, DST)

General focus on computer use, not only at the workplace.

*IT use and the companies* - 2003  (in Danish: Virksomhedernes brug af IT), published by Statistics Denmark (Danmarks Statistik, DST)

*Use of the computer in the workplace in Denmark* - 1999, published by the Danish National Institute of Occupational Health (Arbejdsmiljøinstituttet, AMI)

Finland

Finnish Quality of Work Life Surveys (FQWLS)

Personal face-to-face interviews

1977: sample size 7,500 employed persons, 5,778 persons in data. (response rate 91%)
1984: sample size 5,000 employed persons, 4,502 persons in data. (response rate 89%)
1990: sample size 5,000 employed persons, 3,502 persons in data. (response rate 85%)
1997: sample size 3,800 employed persons, 2,979 persons in data. (response rate 79%)
2003: sample size 5,300 employed persons, 4,104 persons in data. (response rate 78%)

The Survey on Adult Education 2000


2000: a sample of about 5,000 persons, aged 19-79 years, living permanently in Finland, response rate: 74%

France

‘Dauphine-Cegos E-Management Observatory’ 2002 Survey

Continuing occupational training survey 2000, INSEE


COI Survey 1997, ‘employees’, DARES
Germany

**BIBB/IAB Survey 1998/1999**

Representative survey of 34,000 people employed

Previous surveys: 1979, 1985, 1992

**Socio-Economic Panel (GSOEP) 1984-2003**

Annual survey, Households panel. The panel was started in 1984.

2003, a sample of more than 12,000 households, and nearly 24,000 persons

**Survey on information technology in companies**

2002 and 2003

Federal statistical office (Statistisches Bundesamt)

Random sample

Spain

**2002 Survey on ICTs and use of electronic commerce**

Spanish Statistical Institute

Sectors considered: manufacturing, construction and services

Sweden

**Work Environment Survey (AMU)**

Statistics Sweden (SCB) conducted biannually since 1989. Each survey covers approximately 10,000 employed persons.

**Swedish Labour Force Survey**

Supplementary questions

The Netherlands

**TAS - TNO Work and Employment**

Response: approx. 4,000; response rates 53% (2000), 45% (2002)

Carried out every two years, since 2000. Representative sample of the Dutch Labour Force (15-64)

**Flexibility and Work**
Ministry of Social Affairs
Carried out once in 1998
Response: 11,351; response rate: 35%
Sample of Dutch employees, the sectors health care and metal industry were over-represented; wholesale and retail were under-represented.

Work in the Information Society
TNO Work and Employment
Response: 1,357; response rate: 13%
Carried out once in 2002
Sample of Dutch employees in profit organisations, the sectors wholesale and retail, and hotels and restaurants were over-represented; financial services were under-represented.

EF/04/134/EN