

Chapter 2

Information and Communication Technology and Quality of Working Life: Backgrounds, Facts, and Figures

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2.1 Introduction

In this chapter, I will describe how communication and information technologies (ICT) have evolved in the past decades and examine whether the use of ICT has had an impact on quality of working life (QWL). I use data from the European Union (EU) and, more specifically, data from several countries in different stages of ICT adoption within the EU to tentatively examine this relationship. Tentatively because the data is reported on an aggregated level: averages from the different countries. I examine whether an increase in the use of ICT in a country also shows an increase or decrease in quality of working life in those countries over time. However, examining the data on such an aggregated level can disguise developments at the individual level. Even if the data at an aggregated level does or does not show a relationship between ICT and QWL, this does not necessarily mean that at the individual level, this relationship is the same. But examining the data at an aggregated level does provide us with a broad picture of how ICT and QWL have developed in those countries in the past decades. Kubicek et al. have analyzed data from the European Union and the USA at the individual level and describe the results in this book (Chap. 3).

2.2 Communication Technology

In the beginning was the word (Genesis, 1:1). People have communicated for a long time and over time have used different methods to increase the speed of communication, varying from sending messages by runners, horses, pigeons, etc. However,

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Table 2.1 Main phases of telecommunication development

Technology	Period
Telegraphy	1830s–1920s
Telephone	1870s–now
Radio	1920s–now
Television	1950s–now
Space technologies, e.g., satellite-based communications	1960s–now
Digital technologies	1990s–now

Adapted from Norris (2002)

the speed of communication was always limited to the speed of the fastest carrier and the limitations of those carriers. Only relatively recently, technology has been used to increase the speed of communication (see Table 2.1).

Especially with invention of the computer, and the reduction in the size of computers to such a format that they could be used for personal use in the early 1980s, and the invention of the Internet in the early 1990s, the speed of communication has increased to nearly the speed of light.

For example, the telephone seems to have been around “forever.” However, if you would try and explain to a teenager how the telephone system worked only 25 years ago, she/he would stare at you in disbelief. Dial a number? What do you mean no voice mail? And no number recognition? Then how do you know who is calling? Especially with the development of cell phones in the 1990s, things went very fast (see Fig. 2.1).

The numbers in the figure show the explosive growth of number of cell phones per capita in the period 1997–2007. In 2007 the United Arab Emirates (UAE) had the highest number of cell phones per 1,000 people: 1,709 cell phones. Ten years earlier, in 1999, the UAE had “only” 329 cell phones per 1,000 people. Brazil had 26 cell phones per 1,000 people in 1997, 256 in 2002, and 637 in 2007. Burma, the last country on the list (#212), had 0.2 cell phones per 1,000 inhabitants in 1997, 1.3 per 1,000 in 2002, and 4.2 per 1,000 in 2007. The USA (#72 on the list in 2007) had “only” 847 cell phones per 1,000 inhabitants in 2007, up from 564 in 2002 and 251 in 1997. At the end of 2011, six billion people worldwide had a cell phone subscription. One billion of those cell phones are smart phones (phones that enable communication and information technology).

To summarize, nowadays, about everybody in the developed world has at least one cell phone (and in some countries even two); and many people in developing countries have cell phones too. That means that we can always be contacted, no matter where we are, with whom we are, or what we are doing. Evidently this has many advantages, but it has also distinct disadvantages.

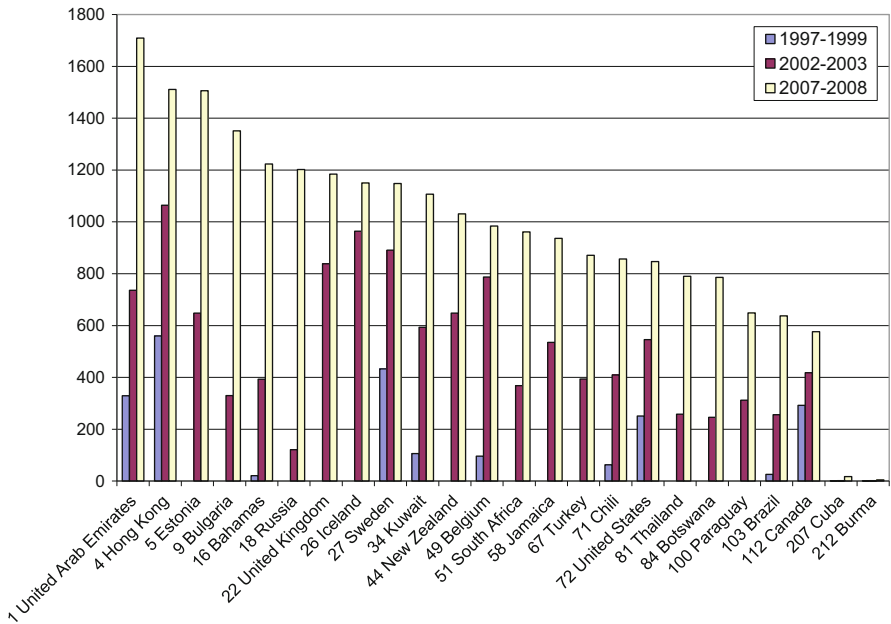


Fig. 2.1 Cell phones per 1,000 people in the period 1997–2007, selected countries CIA Factbook (2013), Nationmaster (2012)

2.3 Information Technology

Already in the 1960s researchers succeeded to connect several computers to each other and thus established the so-called ARPANET. It would take time to develop the protocols needed for the computers to properly “communicate” to each other and even longer before this “service” became available to the general public. The breakthrough occurred in the early 1990s: with the introduction of HyperText Markup Language (HTML), the World Wide Web became an interactive medium. The very first web browser (1989) was written by Tim Berners-Lee while at CERN (a European center for physics research). The year 1991 meant the birth of what we now know as the World Wide Web (WWW). In 1993 the WWW opened to nontechnical users. After 1993, the situation changed dramatically as Fig. 2.2 shows.

While in 1994 only three million people had access to the World Wide Web, this number had increased to 605 million users in 2002 (NUA 2002) and 925 million users in 2004 (ClickZ Networks 2005) and the latest estimates show that – at year-end 2012 – there were 2,405,518,376 people connected to the Internet (Internet World Stats 2012). To give another example of the tremendous growth of the Internet: in 1995 100 billion e-mails were sent annually; in 2002 this number had increased to 5.5 trillion e-mails, spam not included (PCWorld 2003); and in 2010 to 107 trillion e-mails, of which 89 % were spam (Pingdom 2011).

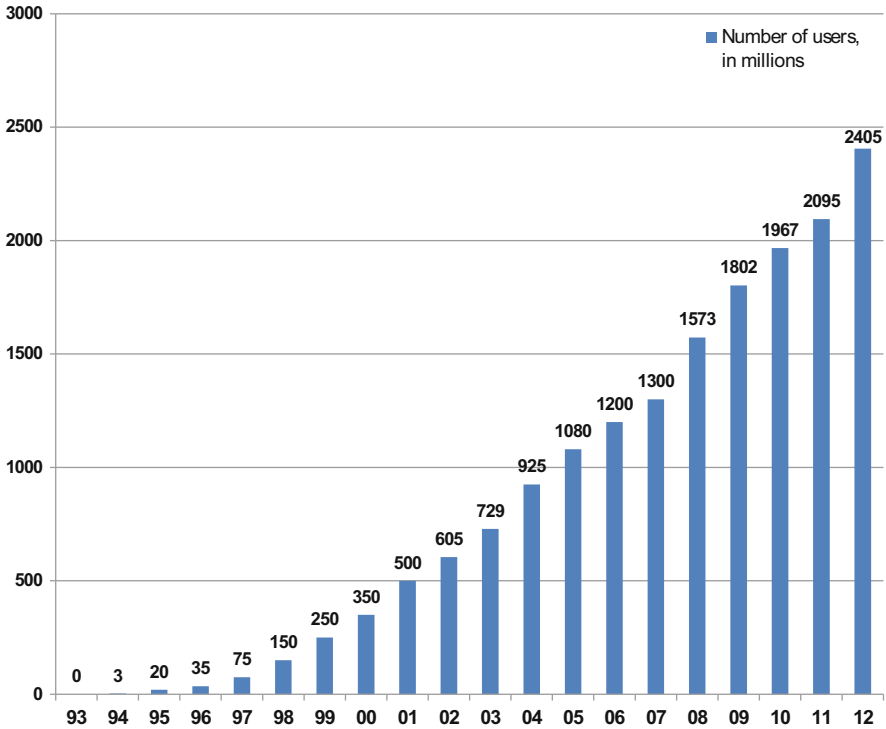


Fig. 2.2 Estimate of Internet users worldwide, in millions (Sources: KlikZ, Computer Industry Almanac, Global Research, Internet World Stats, NUA)

2.3.1 Internet Use in Different Countries Around the World

Results in Fig. 2.3 show the internet connections per 100 people in selected countries, based on statistics provided by the Organisation for Economic Co-operation and Development (OECD 2012).

In 1991, the USA had 3,000,000 Internet users or 1.2 users per 100 people. Most other countries had no Internet connections at all, with an exception for the countries in Northern Europe. In 1995, the situation started changing: in the USA there were 25 million Internet users (nearly 10 per 100 people) and in most other countries – apart from Northern Europe, where there were more users – there were in between 0 and 1 users per 100 people.

In 2000 the situation had changed drastically: in the USA there were 44 people per 100 people connected to the Internet, and in most developed countries, a quarter to a third of every 100 people was connected. In developing countries, the growth was slower: in 2000 between 1 and 5 people were connected to the Internet. For example, in China, in 2000, only 1.8 people per 100 were connected to the Internet.

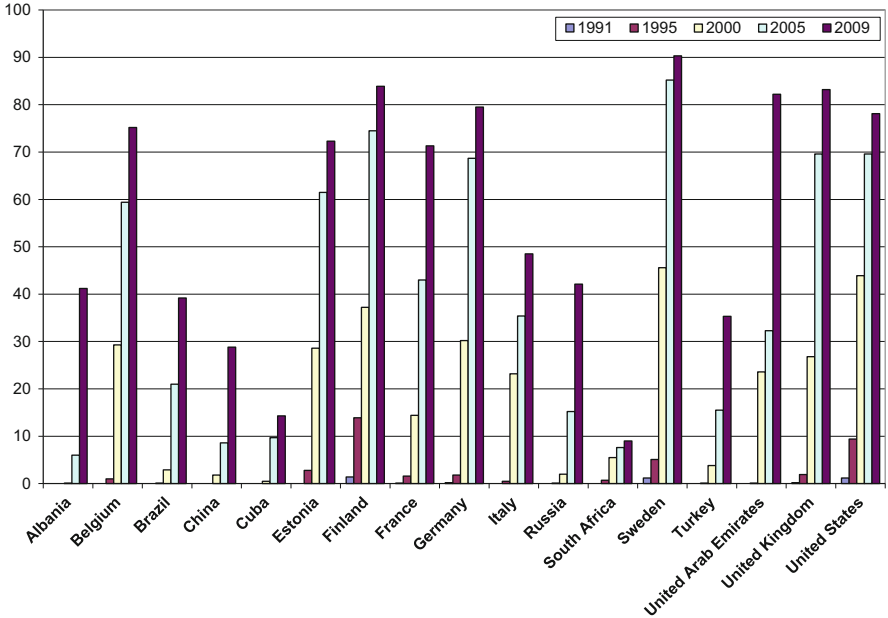


Fig. 2.3 Internet users per 100 people, selected countries, 1991–2009

In 2005, Sweden had surpassed the USA as the country with the most Internet users per 100 people (85.2 vs. 69.6). Other countries in the developed world were still behind the USA but not by far. In developing countries between 6 and 20 people per 100 were connected to the Internet in 2005.

In 2009 China has surpassed the USA in absolute numbers of Internet users (384 million vs. 240 million), but only 28.8 people per 100 were connected to the Internet in China versus 78.1 in the USA. Sweden had the highest number of Internet connections per 100 people in 2009: 90.3. Albania, which had started very slowly and had still only 6 users per 100 people in 2005, had 41.2 users per 100 people in 2009.

2.3.2 Social Media

An even more recent phenomenon is social networking. Internet but nowadays also smartphone users can use software such as LinkedIn, Facebook, Twitter, etc. to inform others about their activities, to keep in touch, and to make new friends. Some of these social media are more work oriented such as LinkedIn, others are more “friend”-related or are just gossipy. The growth of the social media has been astonishing as well. See Fig. 2.4 for the enormous growth of the number of Facebook users in the past 7 years.

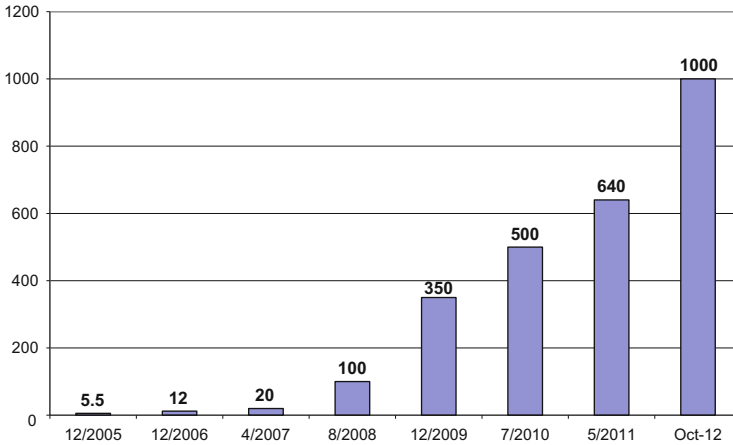


Fig. 2.4 Facebook users in millions, 2005–2012

To summarize, the development and adoption of digital technologies in the past two decades has had an enormous impact. Billions of people around the world are now connected via either cell phones or the Internet to information and to other people. The new technologies have had an impact on our private life but also a huge impact on our work life.

2.4 ICT and Work

The introduction of computers in the workplace in the 1980s and 1990s has had a major impact on work. Jobs such as typists (and real carbon copies with them) have all but disappeared. Other jobs such as bank tellers are still around, but because of automatization, there are fewer people working in them. It is easier these days to get money “out of the wall” (ATMs) than having to go to a bank, fill out the forms, wait in line, etc. In the past 20 years, millions of jobs have disappeared, but millions of other jobs, especially in information technology (IT), have been created. Apart from jobs having become obsolete and new jobs created, computers and IT have had an impact on nearly all other jobs (see Fig. 2.5). Even in historically manual jobs such as jobs in agriculture and construction, computers have become part of the job.

In order to describe the developments and adoption of ICT, and its impact on quality of working life, I use data collected by the European Union in the period 1995–2010. The data was collected by the European Foundation for the Improvement of Living and Working Conditions (European Foundation: <http://www.eurofound.europa.eu/>). The European Foundation conducts several regularly repeated surveys among the countries of the European Union (EU). The European Working Conditions Survey (EWCS) is the longest running survey and has become an established source of information about employment, working conditions, and

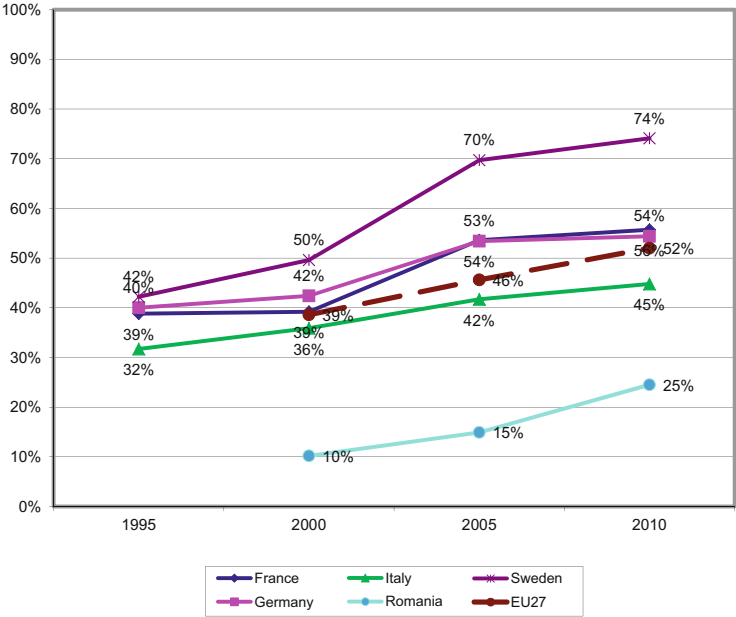


Fig. 2.5 Working with computers at least 25 % of the time, by selected countries and EU27

quality of working life in Europe (European Foundation for the Improvement of Living and Working Conditions 2010; Paoli 2000; Paoli and Merllié 2001; Parent-Thirion et al. 2007). Since 1990, 5 rounds of data have been collected. The most recent survey took place in 2010 in the 27 countries of the EU (EU27) and 44,000 employees were interviewed. The EWCS enables monitoring of long-term trends in working conditions in Europe. Topics covered in the EWCS include employment status, working time, work organization, learning and training, physical and psychosocial risk factors, health and safety, worker participation, work-life balance, earnings and financial security, as well as work and health.

I selected five countries from the EU27 in different phases of development and ICT use: Sweden, Germany, France, Italy, and Romania. The first four countries have been members of the EU since 1995; Romania submitted its official application for membership in 1995 and officially joined the EU in 2007 (Table 2.2).

In the 27 countries belonging to the EU (EU27), the percentage of people working at least 25 % of their time with a computer has increased from 39 % in 2000 to 52 % in 2010. Working with computers is not yet as widespread in the countries belonging to the former East Bloc, such as Romania, but especially in the Nordic countries, such as Sweden, nearly three-quarters of employees work with a computer at least 25 % of their time. More than one-third of employees in Sweden work with computers almost all of the time.

Table 2.2 Characteristics of the countries

	GDP per capita	Internet users per 100 citizens	Cell phones per 100 citizens
Sweden	\$48,000	91	116
Germany	\$40,120	83	127
France	\$39,450	77	101
Italy	\$34,080	57	150
Romania	\$7,540	44	115

Source: The World Bank (2012) and *The Economist* (2012)

2.5 ICT and Effects on Quality of Working Life

2.5.1 Work Intensity

According to some authors, IT has been largely responsible for productivity growth in the developed world, and especially in the USA, in the past 20 years (Dewan and Kraemer 2000; Gordon 2000; Stiroh 2002). Obvious is that IT has had an impact of the perceived speed at which employees are working (see Fig. 2.6).

In 2010 on average, 59 % of employees in the EU27 report that, at least 25 % of their time, they work at high speed. Figure 2.6 also shows how working at high speed has increased in countries such as France, Germany, and Italy but that in Sweden, where in 2005 85 % of employees reported to work at high speed at least 25 % of their time, that number has decreased to 77 % in 2010. In Romania, there has been a decrease in working at high speed in the last 10 years.

Working with tight deadlines has – on an average – also increased in the EU during the past 15 years (see Fig. 2.7).

Working with tight deadlines at least 25 % of the time has increased from 59 to 62 % in the EU27, from 45 to 58 % in France, and from 58 to 73 % in Germany. In Sweden the percentage has increased to 85 % in 2005, but has since seen a decrease to 77 %. In Romania working with tight deadlines has decreased in the last 10 years.

2.5.2 Satisfaction with Working Conditions

One can wonder whether the digitalization of society and work has made people happier. On the one hand, everyone is “connected” and it has become very easy to communicate with each other. On the other hand, we have seen that in the workplace, ICT has caused more working with computers and more often working with tight deadlines. Figure 2.8 shows satisfaction with working conditions in selected countries in the EU27 in the period 1995–2010.

Over the past 15 years, satisfaction with working conditions has remained relatively stable: in the EU27, in 2000 82 % of employees were satisfied or very satisfied with their working conditions; in 2005, 82 %; and in 2010, 84 %. Satisfaction with working conditions is – overall – highest in Germany, with nearly 90 %

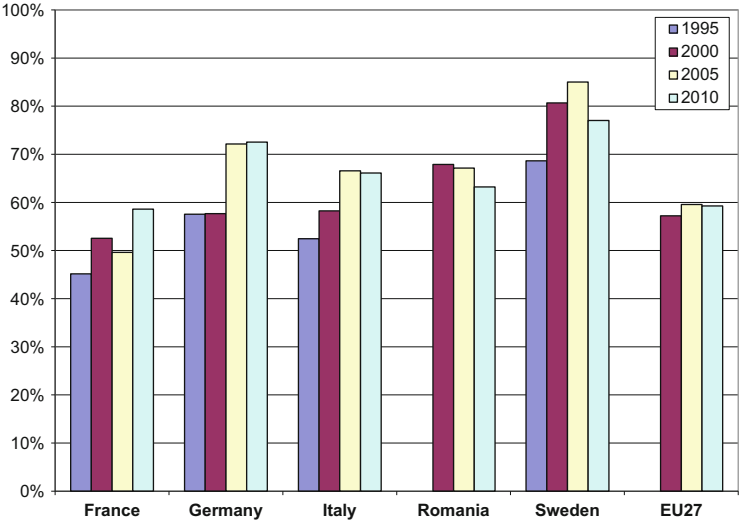


Fig. 2.6 Working at high speed, at least 25 % of the time, 1995–2010, selected countries

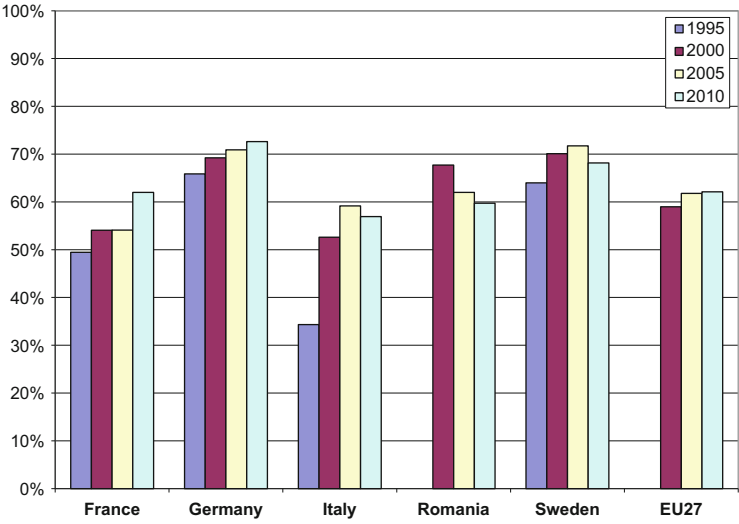


Fig. 2.7 Working with tight deadlines at least 25 % of the time, 1995–2010, selected countries

of employees satisfied or very satisfied with their jobs and lowest in Romania (75 % in 2010). Satisfaction with working conditions in Sweden has decreased in the past 15 years: from 91 % in 1995 to 87 % in 2010.

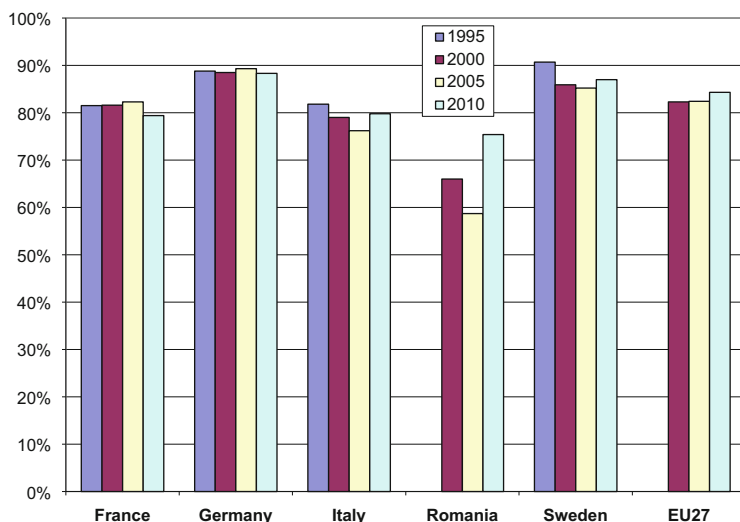


Fig. 2.8 Satisfied or very satisfied with working conditions, selected countries, 1995–2010

2.5.3 Stress

Only recently (2010), the European Foundation has started asking questions about stress in the job on a national level. Figure 2.9 shows the results.

Overall, about 25 % of employees in the EU27 report that their work affects their health in a negative way, resulting in stress. Nearly 35 % of employees in Romania report stress (highest) and 20 % in Italy (lowest).

To summarize, ICT has had a major impact on work in the past two decades. Work has become more intensive, with more work at high speed and with tighter deadlines. The intensification of work in this past period does not seem to be directly related to quality working life at the national level. Satisfaction with working conditions has remained stable, and there is no clear pattern that shows that intensification is related to stress at the workplace. Employees in Germany and Sweden have the most intense work, as measured by working at high speed and working with tight deadlines, but they also have the highest levels of satisfaction with working conditions and, compared to other countries, do not report more stress. In Romania, relatively few employees work with computers; they do report lower levels of work intensification as compared to other countries, but they report less satisfaction with working conditions and more stress.

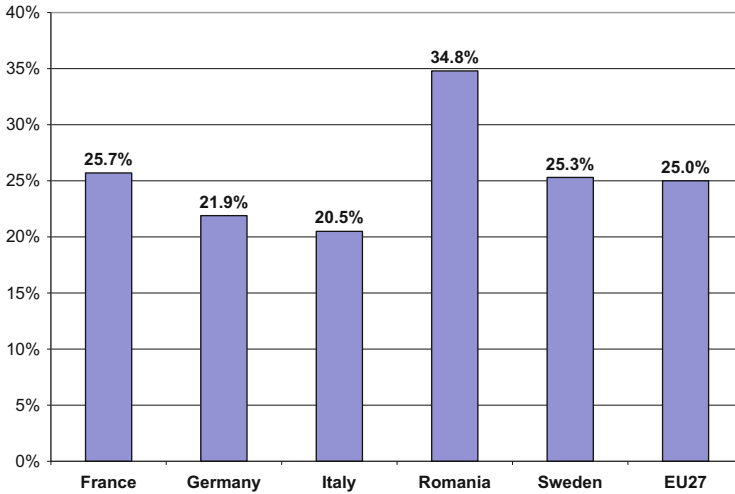


Fig. 2.9 Work affects health in a negative way resulting in stress

2.5.4 ICT Work and Family

The introduction of ICT has made it increasingly easier to work in other places than the workplace. Work nowadays can be done from home, in hotels, at the airport, and even on vacation. Evidently this has huge advantages. However, it also means that the boundaries between work and family life have become less transparent. To exaggerate a little bit to make the point, 25 years ago, people had nine-to-five jobs, and after the work was done at 5 PM, they would “close the door behind them” and go home. Evidently, tight schedules and deadlines also existed in those days, and employees used overtime to meet their demands, but the work took place at the workplace, whether an office or a factory, because the tools and the information they needed for the job was linked to the workplace. Nowadays, information has become portable as well as the tools to perform the work (laptop computers and smart phones). This has caused the borders between work and family to disappear.

For example, results of a recent (unrepresentative) poll by Xobni (Inbox spelled backwards) among 2,200 adults ages 18 and older showed that 72 % of Americans and 68 % of Brits check their e-mail on vacation, when they are taking time off, on weekends, and/or on other nonwork days (Xobni 2010). Thirty-seven percent of the American respondents and 45 % of respondents in the UK are afraid to go without checking their e-mail because they might miss something important. Many of the American respondents (43 %) who check work email outside of regular business hours indicate that they do so in order to ease their workload, and 18 % feel the need to check email outside of work hours in order to have a successful career.

Upon returning from vacation, more than a quarter (26 %) of the American respondents who take vacation/time off of work either feels that they get too many emails to respond to all of them or are too overwhelmed by the volume of emails

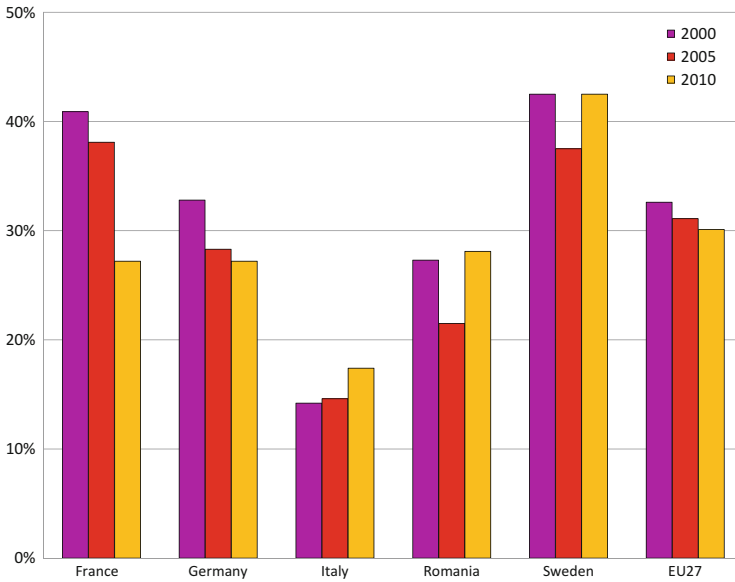


Fig. 2.10 Working hours fit family or social commitments very well, selected countries, 2000–2010

upon returning from vacation as compared to 86 % of British respondents. There is some evidence in the data from the European Foundation that work, and more in particular working hours, has an impact on family life (see Fig. 2.10).

Results in Fig. 2.10 show that in the EU27, the percentage of respondents who say that their working hours fit their family or social commitments very well has decreased from 32.6 % in 2000 to 30.1 % in 2010. The work-family fit is highest in Sweden where 42.5 % of employees report a good fit between working hours and family and social commitments in 2010 and lowest in Italy, where only 17 % of employees report a very good fit between working hours and family and social commitments in 2010. Chapter 8 by Demerouti et al. describes in detail the impact of ICT on working conditions and work-life balance.

2.6 ICT and Quality of Working Life over Time

The results of the surveys of the European Foundation in 2000 and 2010 are summarized in Table 2.3. In the table the percentages of employees who report working with computers at least 25 % of their time, working at high speed at least 25 % of the time, and working with tight deadlines at least 25 % of the time report that their work affects health negatively, resulting in stress, and the percentages of employees who are satisfied or very satisfied with working conditions in 2010 are shown. Further, the changes between 2000 and 2010 for four out of the five topics

Table 2.3 Summary table developments in ICT, working conditions, and quality of working life in selected countries of the EU, period 2000–2010

	WWC 2010 (%)	Δ WWC 2000– 2010 (%)	WHS 2010 (%)	Δ WHS 2000– 2010 (%)	WWD 2010 (%)	Δ WWD 2000– 2010 (%)	SWC 2010 (%)	Δ SWC 2000– 2010 (%)	WAH 2010 (%)
France	56	+16.5	59	+6.1	62	+7.9	79	−2.2	26
Germany	55	+12.0	73	+14.9	73	+3.4	88	−0.2	22
Sweden	74	+25.5	77	+7.9	68	+4.3	87	+1.1	25
Italy	45	+8.9	66	−4.7	57	−8.0	80	+0.8	21
Romania	25	+14.3	63	−3.6	60	−1.9	75	+9.4	35
EU27	52	+13.4	59	+2.0	62	+3.1	84	+2.0	25

Δ: difference between 2000 and 2010. WWC 2010: working with computers more than 25 % of the time 2010; WHS 2010: working at high speed at least 25 % of the time 2010; WWD 2010: working with tight deadlines at least 25 % of the time 2010; SWC 2010: satisfied or very satisfied with working conditions 2010; WAH 2010: work affects health: stress 2010

are shown. The question about working conditions negatively impacting health and causing stress was only asked in the 2010 survey.

Results in Table 2.3 show that Sweden has the highest percentage of employees working with a computer at least 25 % of their time (74 % in 2010). Sweden has also seen the highest increase in employees working with a computer in the past decade (+25.5 %). Romania has the lowest percentage of employees working with a computer, at least 25 % of their time (25 %). This percentage has increased with 14.3 % in the past decade. Overall, in the EU27, more than half of employees (52 %) work with a computer, at least 25 % of their time. This number has increased from 38.6 % in 2000, an increase with 13.4 %.

Sweden is also the country with the highest percentage of workers who reported working at high speed at least 25 % of their time in 2010 (77 %). This percentage has increased with nearly 8 % since 2000. France is the country with the lowest percentage of workers who report that they have to work at high speed at least 25 % of their time in 2010 (59 %). This percentage has increased with 6.1 % since 2000. The percentage of France (59 %) is comparable to that of the EU27 (59 %). The increase in employees working at high speed is lower in the EU27 (+2.0 %) than in France (+6.1 %). The relatively lower increase in the EU27 can be explained by the fact that the percentage of employees who report to working with high speed has actually decreased in the past decade in some of the countries in the EU27, such as Italy (−4.7 %) and Romania (−3.6 %).

Germany has the highest percentage of employees who reported that they work with tight deadlines at least 25 % of their time in 2010 (73 %). This percentage has increased with 3.4 % since 2000. A bigger increase in percentage of employees who work with tight deadlines took place in France (+7.9 %). On the other hand, countries such as Italy (−8.0 %) and Romania (−1.9 %) showed a decrease in the percentages of employees who report working with tight deadlines.

Romania is the country where in 2010 the highest percentage of employees report that work affects health negatively, resulting in stress. In Italy the percentage of employees reporting stress is much lower than in Romania: 21 % vs. 35 %.

Finally, Germany has the highest percentage of employees that report being satisfied or very satisfied with the working conditions in their job (88 %), closely followed by Sweden (87 %). However, satisfaction with working conditions decreased slightly in Germany (−0.2 %) and France (−2.2 %) in the last 10 years. The largest increase in satisfaction with working conditions was reported in Romania: the percentage of employees who reported to be satisfied or very satisfied with their working conditions increased from 66 % in 2000 to 75 % in 2010, an increase of 11 %.

2.7 Conclusion

Information and communication technology (ICT) has a major impact on many aspects of our life, ranging from family to work life. In this chapter I have provided some examples of the explosive growth of ICT worldwide, and I have compared survey data collected in the period 1995–2010 in several countries in the EU27 about use of computers at work and the impact it has on quality of working life. The 5 European countries that I compared are in different stages of ICT adoption (see Table 2.2). The results show how rapidly computers have been introduced in the workplace in the past 20 years. In 2010, more than half of employees in the EU27 worked with a computer at least 25 % of their time. I examined whether this increase in use of computers had an impact on quality of working life in those countries. Results show that in most countries working at high speed has increased in the past decade, as well as working with tight deadlines. However, overall, most employees in the EU27 are satisfied or very satisfied with their working conditions. The EU27 average was, respectively, 82.3 % in 2000, 82.4 % in 2005, and 84.3 % in 2010.

The results show that there is no direct relationship between ICT use and quality of working life at the national level. On the one hand, working at high speed and working with tight deadlines is higher in countries with a high percentage of employees working with computers, such as Sweden and Germany, but on the other hand, employees in those countries are more satisfied with their working conditions and report less stress. Further, an increase in computer use in the past decade does not always “translate” in an increase in working at high speed, working under tight deadlines, or employees reporting less satisfaction with working conditions. However, the data that I used at an aggregate level can mask relationships at the individual level. Further, evidently other factors can play an important role.

ICT has had a major impact on how our work is organized and how we perform our jobs. Statistics show that employees more and more use computers for their work, but also that work has intensified, as measured by working at high speed and with tight deadlines. ICT obviously has advantages and disadvantages. Among the advantages are that we are better connected and that we can be reached everywhere and anytime, that many of us can do their work wherever and whenever they want

to. One of the disadvantages is that the boundaries between work and family have become less transparent and that work has permeated our private life.

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