ICT, teleworking and labour potential

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Abstract: Highly qualified human resources are essential for the development and dissemination of knowledge and constitute the crucial link between technological progress and economic growth, social and environmental development, and the population welfare in general. To face the challenges of the accelerated pace of innovation and technological development a workforce increasingly specialized and efficient is required. The level of education is one of the key factors to facilitate access to employment, to speed up the insertion in the employment of persons belonging to the labour potential of a country.

The links between the size and characteristics of labour potential and research, innovation and ICT will be highlighted in this paper by two categories of information: human resources in science and technology (HRST), and the teleworkers.

For both categories of information the primary data source is the Labour Force Survey (LFS) carried out by the National Institute of Statistics (INS) on the population households.

Keywords: Labour potential, Human resources, Science and technology, Teleworkers, Research, innovation and ICT

JEL Classification: I25, J24

Introduction

Highly qualified human resources are essential for the development and dissemination of knowledge and constitute the crucial link between technological progress and economic growth, social and environmental development, and the

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population welfare in general. The intersection of science and technology on the one hand, and human resources, on the other hand, is a key ingredient for competitiveness and economic development, and, also, a means to protect and enhance the environment in the coming decades. In modern times the speed of development and application of new technologies is extremely high. To face the challenges of the accelerated pace of innovation and technological development a workforce increasingly specialized and efficient is required. ICT has a catalyst impact in three key areas:

- Productivity and innovation, by facilitating creativity;
- Modernization of public services (for example: health, education, transport);
- The progress in science and technology, by supporting cooperation and access to information.

In present days, ICT has become an important driver of everyday life, whether personal or professional. The overwhelming majority of people in Europe today use a computer, a "smart" mobile phone, a tablet, etc., for several purposes; for the younger generation in particular, the use of such equipment is normal in activities of daily living.

The level of education is one of the key factors to facilitate access to employment, to increase the speed of insertion in the employment of persons belonging to the labour potential of a country. The links between the size and characteristics of labour potential and research, innovation and ICT can be highlighted by the argument of two categories of information:

a. human resources in science and technology (HRST), and

b. the teleworkers.

For both categories of information the primary data source is the Labour Force Survey (LFS) carried out by the National Institute of Statistics (INS) on the population households.

Labour potential

Human resources in science and technology (HRST)

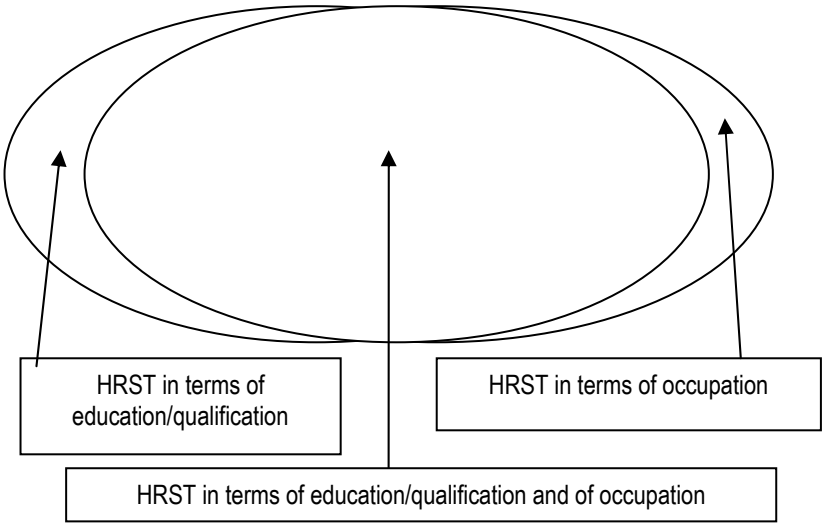
According to the Canberra Manual of OECD (1995), human resources in science and technology (HRST) represent the persons who fulfil one or other of the following conditions:

(i) successfully completed education at the third level in a science and technology (S&T) field of study;

(ii) not formally qualified as above, but employed in a S&T occupation where the above qualifications are normally required.

Main HRST categories are shown in the diagram bellow:

Figure 1. Main HRST categories



Source: OECD, Canberra Manual of (1995), p. 17.

In other words, in terms of statistical measurement, the indicator has two dimensions: the supply and demand of human resources in science and technology, and their meeting provides information on the total size of human resources in science and technology.

The first dimension, the supply, is expressed in terms of education (through qualification/specialization) while the second dimension, the demand, in terms of actual employment in science and technology.

The total number of persons representing the human resources in S&T amounted to about 2.7 million in 2013, 600 thousand more as compared to 2004. Women are the majority, representing 54.7% in the previous year.

Out of these resources, over 80% (2.2 million in 2013) are specialized in S&T activities. Whatever the type of graduated studies about two-thirds (1.8 million in 2013) of total human resources in S&T actually work in these areas.

The number of people who meet both conditions – in terms of education/ qualification and in terms of occupation – amounted to 1.2 million people in 2013, nearly 400 more than ten years ago. Out of them, slightly more than half a million people are employed in purely scientific and engineering occupations.

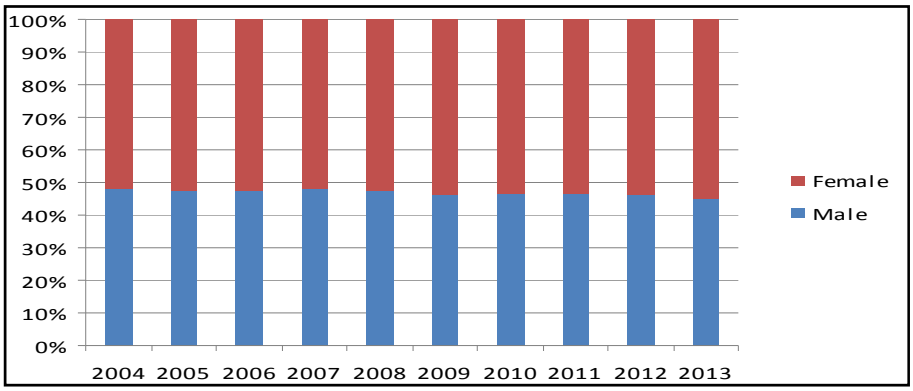
Table 1 – Evolution over the past decade of the main categories of HRST

	Total HRST (qualif./educ. and / or occup.)	HRST qualif./educ. (tertiary educ.)	HRST occup. (in S&T fields)	HRST qualif./educ. and occup.	HRST scientists and engineers
2004	2130	1373	1602	845	230
2005	2194	1453	1624	883	249
2006	2294	1530	1731	968	376
2007	2308	1579	1739	1010	393
2008	2416	1698	1813	1094	412
2009	2477	1780	1819	1121	401
2010	2548	1878	1836	1165	414
2011	2688	2037	1898	1248	546
2012	2734	2126	1853	1244	536
2013	2711	2179	1764	1233	516

Source: INS, Labour Force Survey (AMIGO).

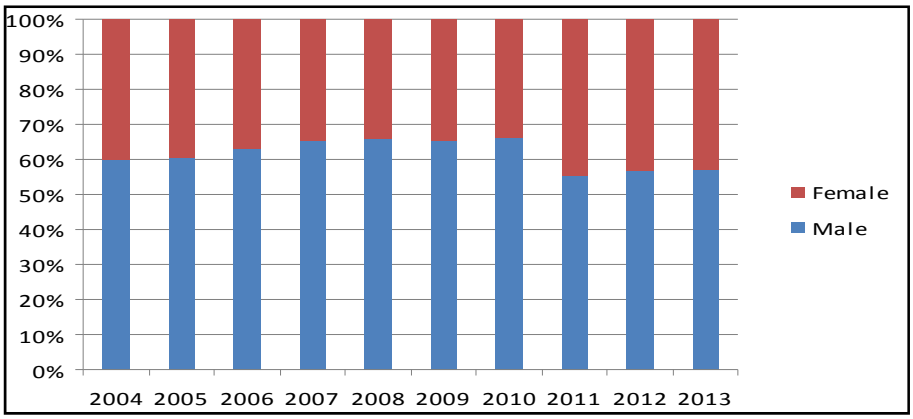
Women prevail (example in Figure 2) in all categories that are part of human resources in science and technology (HRST), regardless of category (in terms of qualification/education, in terms of occupation, in terms of both conditions – qualification/education and occupation). The only category where men prevail is the category of scientists and engineers (Figure 3).

Figure 2. Structure by gender of HRST in terms of educ. and occup., %



Source: INS, Labour Force Survey (AMIGO).

Figure 3. HRST structure by gender for category „scientists and engineers", %



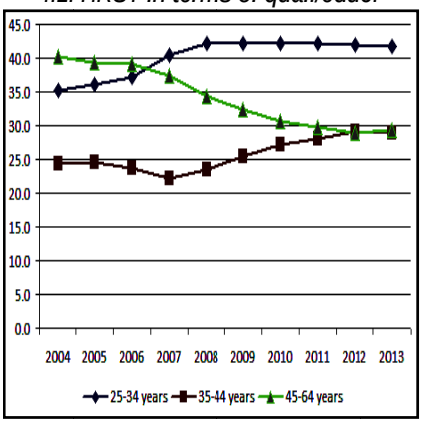
Source: INS, Labour Force Survey (AMIGO).

HRST (in terms of qualification/education and/or occupation) experienced a "rejuvenation" over the last decade, especially for the category measured only by education level (Figure 3.1.). If in 2004, 2 of 5 persons from HRST in terms of qualification/education were aged 45-64 years, in the years after the accession of Romania to the European Union, the report has been changed; this proportion was noticed among the young people, aged 25-34 years. Also HRST in terms of

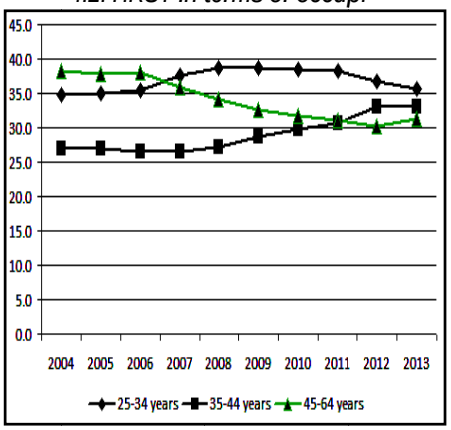
occupations underwent a similar change process with the difference that, in the past three years, the share of young people has followed a downward curve.

Figure 4. HRST structure of people aged 25-64 by age groups, %

4.1. HRST in terms of qual./educ.



4.2. HRST in terms of occup.



Source: INS, Labour Force Survey (AMIGO).

HRST represented, in 2013, 16.3% of the population aged 15-74 (by almost 4 percentage points more as compared to 2004) and less than a quarter (23.4%) of total population (compared to 18.8% in 2004).

HRST from the category of scientists and engineers represented only 3.1% of the population aged 15-74 years and 5.2% of total labour force.

Table 2. Evolution over the last decade of the share of main categories of HRST in the total population aged 15-74 and the total labour force, %

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HRST total (in terms of qualification/education and/or occupation)										
% in total population aged 15-74	12.6	12.9	13.5	13.6	14.3	14.7	15.1	16.0	16.4	16.3
% in total labour force	18.8	19.7	20.6	20.6	21.6	22.1	22.4	23.7	23.8	23.4

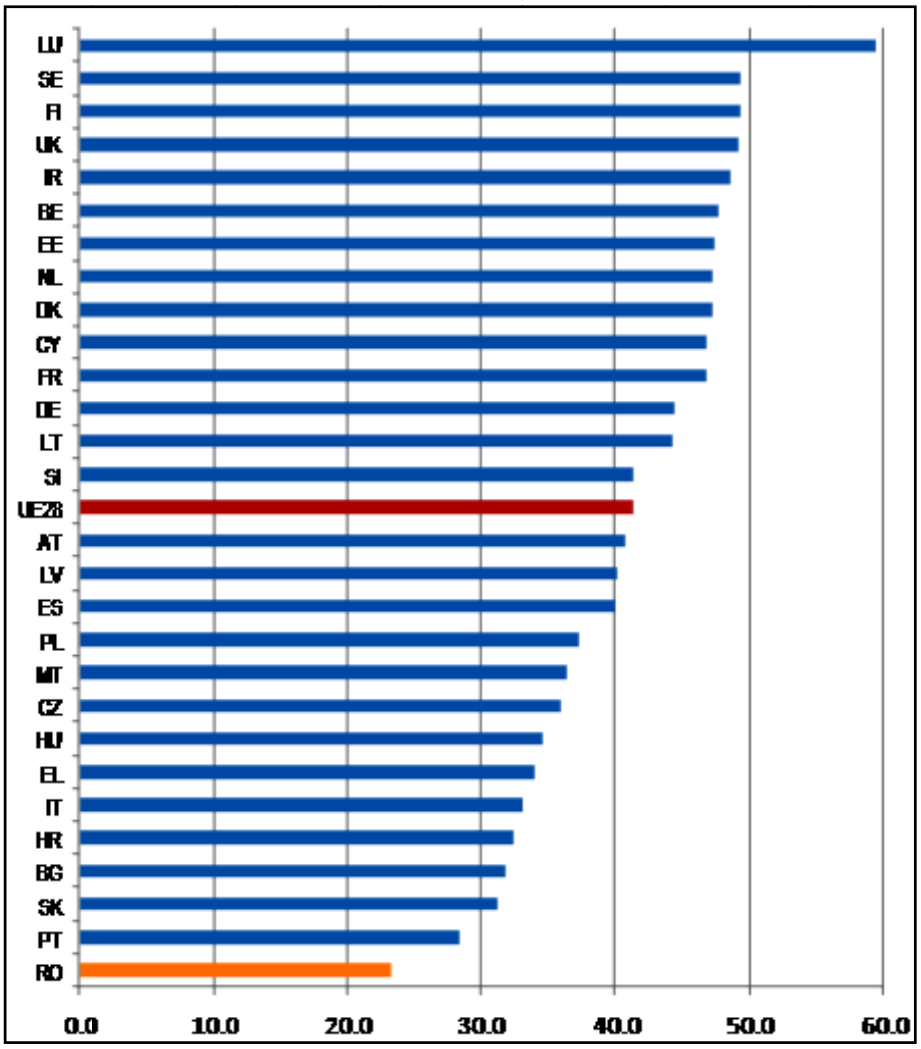
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HRST in terms of qualification/education										
% in total population aged 15-74	8.1	8.5	9.0	9.3	10.0	10.5	11.2	12.2	12.7	13.1
% in total labour force	11.3	12.2	13.0	13.3	14.3	15.0	15.7	17.2	17.6	18.1
HRST in terms of occupation										
% in total population aged 15-74	9.5	9.5	10.2	10.2	10.7	10.8	10.9	11.3	11.1	10.6
% in total labour force	15.9	16.5	17.3	17.4	18.2	18.3	18.4	19.2	18.6	17.7
HRST in terms of qualification/education and occupation										
% in total population aged 15-74	5.0	5.2	5.7	5.9	6.5	6.6	6.9	7.4	7.5	7.4
% in total labour force	8.4	9.0	9.7	10.1	11.0	11.3	11.7	12.6	12.5	12.4
HRST for category of scientists and engineers										
% in total population aged 15-74	1.3	1.5	2.2	2.3	2.4	2.4	2.5	3.3	3.2	3.1
% in total labour force	2.0	2.5	3.8	3.9	4.1	4.0	4.2	5.5	5.4	5.2

Source: INS, Labour Force Survey (AMIGO)

The share of 23.4% of the total HRST (in terms of qualification/education and/or occupation) in total labour force in 2013 placed Romania on the last position compared to other European Union member states and by 18 percentage points below the EU28 average (41.4%). The last three countries close to Romania are Portugal (28.4%), Slovakia (31.2%) and Bulgaria (31.9%). In Luxembourg – occupying the first position in the hierarchy – this share is 59.5% (more than double that of Romania).

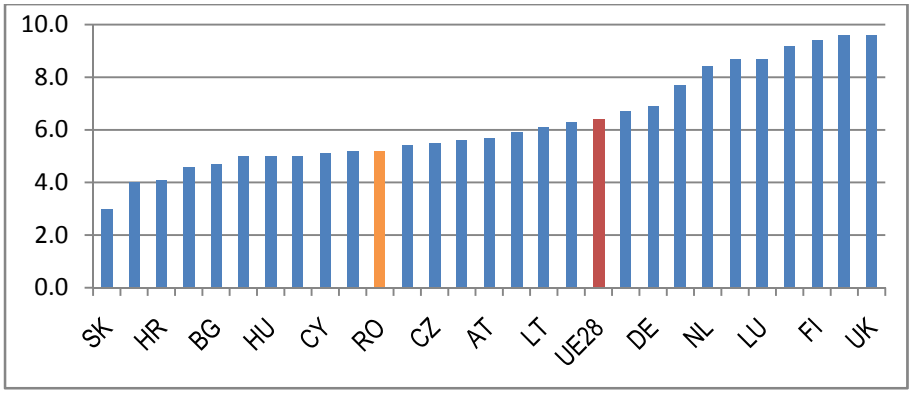
The EU28 average for the share of HRST actually employed in scientific and engineering occupations in the total labour force was, in 2013, 6.4%, by 1.2 percentage points more than in Romania (5.2%). In this case, the last position belongs to Slovakia (3.0%), and the top positions are occupied by the United Kingdom and Sweden (each by 9.6%).

Figure 5. Share of total HRST (in terms of qual./education and/or occupation) in total labour force in Romania in comparison with EU28 and EU member states in 2013, %



Source: Eurostat, http://epp.eurostat.ec.europa.eu.

Figure 6. Share of HRST for the category of scientists and engineers in total labour force in Romania in comparison with EU28 and EU member states in 2013, %



Source: Eurostat, http://epp.eurostat.ec.europa.eu

Teleworkers

Teleworking means the use of information technology and telecommunications to replace travel to and from work. Teleworking allows employees to work at home or in a distance working place, one or more days a week, using communication tools such as: telephone, fax, modem, Internet teleconferencing, e-mail or IM, to fulfil their work duties from a remote location.

Teleworking system has some advantages and disadvantages highlighted below from both employer and employee perspective:

a) from employer perspective:

Advantages	Disadvantages
Low cost since no need of a work space for teleworkers	Higher costs for ensuring not only the computer (or other equipment) but also the equipment needed for tele-connecting those working in teleworking system
Higher productivity of teleworkers are protected by stoppages occurring at an ordinary job	More difficult to manage the activity of teleworkers as well as to ensure their appropriate monitoring
Better motivation for teleworkers with advantages in terms of lower levels of stress	Higher risks in terms of information security protection for teleworkers

Advantages	Disadvantages
Depending on the type of work or services to be provided, the employer has the flexibility to organize the work with the possibility of combining work done in ordinary space (fixed) and the work done at home (teleworking) by employees	More restrictive coverage of activities suitable for teleworking system

b) from employee perspective:

Advantages	Disadvantages
The teleworking saves time needed for travelling to and from the fixed place of work (job)	Teleworkers suffer from isolation without a possibility of social interaction with their co-workers
The teleworking saves the corresponding costs of transport to and from the fixed place of work (job)	Risk of working with lower efficiency because of the distractions that can occur in the home environment
Opportunity for working flexible hours without affecting career	Not always the home environment is adequate for the teleworking system
Allows for a better balance and reconciliation of personal and professional life	Risk of lack of self-discipline in carrying out work at home, without supervision

In 2013, out of total employment (9,247 thou. persons) 3,473 thou. persons (37.6%) were users of ICT, and the teleworkers (working remotely and using ICT) accounted for 632 thou. people, representing 6.8 % of total employment and 18.2% of total number of ICT users.

Most users of ICT in their professional activity are men (56.7%) and live in towns and cities (78.7%). The share of men among teleworkers is significantly higher (86.2%), but lower for urban residents (65.0%).

Male and female ICT users are found in close proportions as regards their share in total employment (38.4% of men employed and 36.5% of employed women respectively), but presents significant disparities in the two areas of residence: 54.0% of employed persons in urban areas and only 17.7% of those in rural areas. Just little over a tenth of men employed and only 2.1% of employed women are teleworkers. Discrepancies are observed between urban and rural areas, the share of employed persons working in cities and towns in the teleworking system being 8.1%, and in communes and villages, it is 5.3%.

Table 3. Employment using ICT in 2013, by type of ICT and by gender and urban/rural area, thou. persons

	Total	Using ICT	Out of which::			
			Using only computer	Using computer and telecomm.	Using only telecomm.	Teleworkers
Total	9247	3473	200	1896	1377	632
Male	5128	1970	75	889	1006	544
Female	4120	1504	125	1008	371	87
Urban	5058	2733	177	1677	879	410
Rural	4189	741	23	219	498	221

Source: INS, Labour Force Survey (AMIGO)

More than half of the employed users of ICT in their professional activity (54.6% of users of ICT) use both the computer and telecommunications equipment, with a higher frequency among the female population (67.0%) and among urban residents (61.4%).

Only 5.8% of the total employed persons users of ICT are using only the computer and 2 of 5 employed persons users of ICT are using other telecommunication equipment (excluding computer), especially men (51.1% of male ICT users) and persons employed in rural areas (over two thirds).

Employers are the largest users of ICT. 9 out of 10 employers and 1 of 2 employees use ICT for their professional activity. The frequency of ICT use is higher among male employers (92.0%) and employees in urban areas (54.4%).

Table 4. Employment using ICT in 2013, by status in employment, gender and urban/rural area, thou persons

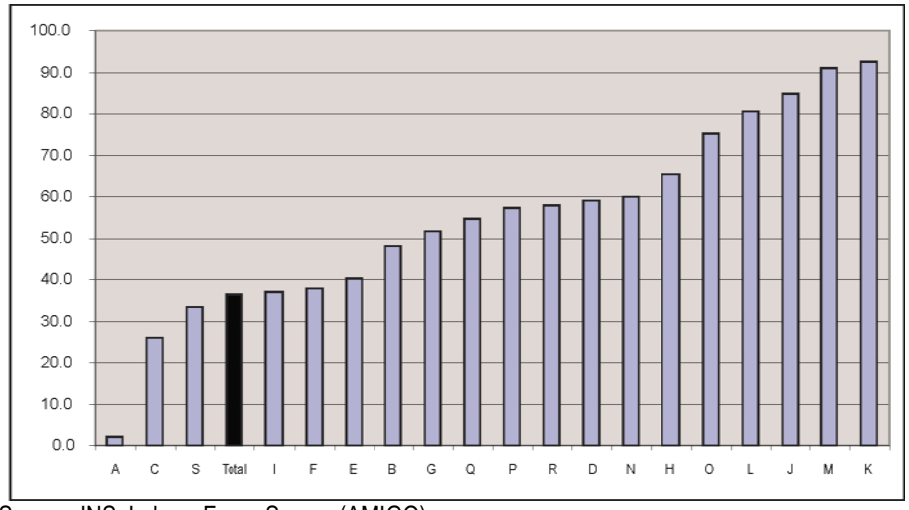
	Total	Male	Female	Urban	Rural
Total	3473	1970	1504	2733	741
Employee	3123	1717	1407	2525	598
Employer	104	77	27	84	21
Self-employed	215	162	52	119	96
Family worker	31	13	18	5	26

Source: INS, Labour Force Survey (AMIGO).

In the teleworking system are met only one-fifth of employers and 7.8% of employees with significant differences by gender for the latter: 12.6% of male employees compared to only 2.1% of female employees.

If the average use of ICT for the entire employment is 37.6%, by economic activities significant differences are noticed. The most fervent users of ICT are those working in financial intermediation and insurance (92.6%), followed by those in professional, scientific and technical activities (91.1%) and only on the third place people employed in information and communication activities (84.7%).

Figure 7. Share of persons using ICT in employment from each economic activity, 2013 (%)



Source: INS, Labour Force Survey (AMIGO).

Where:

A	Agriculture	K	Financial intermediation and insurance
B	Mining and quarrying	L	Real estate transactions
C	Manufacturing	M	Professional, scientific and technical activities
D	Production and supply of electric and thermal energy, gas, hot water and air conditioning	N	Activities of administrative services and activities of support services
E	Water distribution; sanitation, waste administration, decontamination activities	O	Public administration and defence; social insurance of public system
F	Constructions	P	Education
G	Wholesale and retail; repair of motors vehicles and motorcycles	Q	Health and social assistance
H	Transport and storage	R	Showbiz, cultural and recreation activities
I	Hotels and restaurants	S	Other activities of the national economy
J	Information and communications		

Of the 632 thou persons employed in the teleworking system, over one fifth (22.2%) work in transport and storage, followed by those working in construction (17.8%) and those in trade (13.4%).

In four of the ten major groups of occupations, ICT amounts to a large scale to over three quarters of total number of employed persons in each category. The most fervent users of ICT are the major group 1 – group of members of the legislature, executive, senior government leaders and senior officials and managers (92.7%), followed by employed persons in major group 2 – professionals (82.7%), of those in major group 4 – Clerical support workers (80.1%) and those in major group 3 – Technicians and associate professionals (76.2%).

More than a third of teleworkers are professionals (specialists in various fields), workers in services and sales and skilled workers.

Conclusions and recommendations

ICT is part of everyday life. The links between labour potential and ICT are very tight. Those who possess the necessary knowledge to use ICTs have more chances on the labour market penetration, the use of technology and telecommunications being widely practiced in all national economic activities.

The education system plays an important role in preparing the young generation to acquire the necessary knowledge so as to face competitiveness and become highly skilled / specialization.

The technological developments have a crucial impact on the labour market. On one hand, more and better skilled professionals are needed and, on the other hand, new forms of time and working arrangements are required. The latest ones are referring to a more flexible labour market where people can work at different hours (and not at fixed hours) such as early in the morning, in the evenings, during the nights etc. and, at different places or spaces such as at home, in train, in buses, in libraries, in parks etc. The modern ICTs offer the opportunity of a high degree of independence of work and, most probably, the teleworking will widely extend in the near future.

In present days, the Romanian labour market is very rigid as concerns the work organization and the working time arrangements. This rigidity is proven by the low share of the teleworkers in the total employment that is of only 6.8% (in 2013). Policy makers play a major role in drafting adequate labour legislation. National labour legislation is outdated and does not keep up with the progresses occurred in the real life.

The model of "*fixed start/end of the working day"* which represents a regular (not necessarily constant) long-term pattern of fixed daily working times without the possibility to start or end the working day later/earlier, is the most frequent model of work and time arrangements met on romanian labour market.

For better work conditions, which give opportunity of improved reconciliation between work professional and personal/family life, several, more flexible and adequate, forms of time and work arrangements have to be introduced in the national labour legislation.

In this respect, I am suggesting the following models of working time arrangements:

- "*Staggered working hours*" (non-fixed start/end of the working day): workers may start earlier and finish later outside a range of hours when presence is compulsory but the hours outside this range are not passed to a time accounts system. The number of hours worked each day has to be equal to the contractual number.
- "*Working time banking*" (non-fixed start/end of the working day): a system of accumulation and settlement of debit and credit hours around the standard number of weekly or monthly working hours. Over a longer period, the average number of working hours has to be equal to the number of contractually agreed working hours.
- "*Start/end of the working day varying by mutual agreement*": the start and end of the working day usually vary daily or weekly and they are individually agreed with the employer.
- "*Annualised hours contract*": only the annual number of hours, for example 1600 hours, is specified but the distribution of the weekly number of hours worked varies throughout the year. This number of weekly working hours can be determined by the employer depending on production or service needs.
- "*On-call work*" (or "zero hours" contract): as an open-ended contract without a guarantee for a fixed number of hours, workers being called into work and report to work at a short notice only when needed. Although the employer has no obligation to provide work, a minimum number of hours may be agreed in some cases between the employer and the worker. On-call workers can be scheduled to work for several days or weeks in a row but they do not have a regular schedule. This situation is different from stand-by hours when the person "on duty" is waiting for an emergency call.

National labour legislation has to be changed in the sense of encouraging adaptability of businesses and their employees, including with regard to quality in work, to the new and modern demands on flexitime and on flexi-place of work.

Changes to labour legislation, in respect of those suggested above, would lead to a more flexible labour market and to better employability, a large share of people from labour potential who do not work having real chances to find a job.

Acknowledgements

This paper has been financially supported within the project entitled „SOCERT. Knowledge society, dynamism through research", contract number POSDRU/ 159/1.5/S/132406. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. Investing in people!

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