

Information and Communication Technology's Skills among the Working Population of Serbia

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ABSTRACT

Major social shifts in the economy conditioned by Information and Communication Technology (ICT) have led to equal shifts in the labor market. In this paper, the use of ICT skills in Serbia is presented through an analysis of the microdata from the survey "*The Usage of Information and Communication Technology on individuals/households in the Republic of Serbia for 2020*". Results showed that Internet users have increased in the last five years. According to results, in 2020, 78.4% of people between 16 and 74 used computers in the last three months. The number of unemployed who used a computer in 2020 was 83.6%, and the number of employed who used a computer was 92.7%. Students used computers 99.8% in 2020. On the other hand, 96.3% of employed used the Internet in 2020, while 89.2% of unemployed used Internet at the same period. The use of e-government web services is almost present to the same extent among students, the employed and unemployed. Unlike online shopping, students are most likely to use e-government services, even though the employed and unemployed both use online shopping equally. However, comparing statistical data, Serbia is not at the European level in ICT usage, which can significantly jeopardise individuals' position in the labor market. There are substantial distinctions between youth and older individuals, especially regarding advanced skills. This affects the creation of digital exclusion, which increases the lack of resources that can be employed in better-paid jobs. The main solution for solving the digital divide is education to ensure equal competitiveness for all individuals on the labor market.

Key words: *ICT skills, working population, Serbia, labor market*

JEL Classification: J40, J64

INTRODUCTION

Information and Communication Technology (ICT) and digitization have led to rapid changes in all spheres of society – education, trade, international economy, and health, including significant changes in the labor market. ICT skills are essential for every individual to learn and work while accessing information on the Internet and finding reliable data. Considering its role in the process of social transformation, ICT creates new business opportunities and employment possibilities. The development of ICT has conditioned faster changes in the labor market to which the working-age population must adjust. Many authors say that the development of ICT skills is one of the most critical factors for the growth of the European labor market (Postula et al., 2021; Herman 2020). The impact of ICT on the labor market is primarily reflected in evolving business dynamics, changes in working conditions, and the skill requirements an individual must possess to perform a particular job. Having ICT skills allows individuals to carry out a manifold of work-

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related tasks. It enables them to communicate over online channels, find information and use a computer in general. Since the Internet assists with decision-making and problem-solving skills, multiple European countries are developing strategies to help individuals in the labor market to develop basic and advanced ICT skills and Internet and computer skills. ICT skills have become a mandatory requirement for employment in today's job market. Moreover, possessing ICT skills allows individuals to become more competitive in labor market. In contrast, a lack of these skills can reduce employment opportunities or result in a potential job loss.

ICT skills provide an opportunity to create new jobs and improve existing ones. Still, they also undoubtedly have had an impact on the obsolescence of numerous positions and professions which ICT has made redundant. Despite its low-barrier access, benefits from information and communication technologies can remain untapped if the user does not have the needed skills and competencies to use ICT.

According to Eurostat report, *General developments in the labor force for people with an ICT education* (2021) labor force in EU that had an ICT education was more than 2 million persons, and by 2020, this number increase to 2.9 million. Around 2.7 million persons aged 15-74 in the EU were employed and in possession of an ICT education, and 219.000 persons with ICT education were unemployed. If we observe this situation according to the gender of respondents, Eurostat report *Employed persons with an ICT education by sex* (2021) stated that men accounted an 82.8% of the 2.7 million persons in the EU who were employed and in possession of an ICT education. Women accounted for only 17.2% of labor force who were employed and with an ICT education. If we observed the age of the respondents, 65.7% of employed individuals in the EU with ICT education were aged from 15 to 34 years. A number of young populations with ICT education from 2010. to 2020. was growing 2.7% per annum.

If we observe a level of Internet usage in the households in 2020, national statistical centers of different countries conduct a questionnaire created according to the Eurostat methodology *Using of ICT in households*. Data shows that that the highest percentage is in Scandinavian countries, that are considered as a leader in using of ICT and digital technologies – Island has the biggest score – 98% of using the ICT in households, the Netherlands with 97%, Finland 96%, Sweden 94%. Also, the United Kingdom with 97%, Slovenia, Austria and Lithuania and Poland 90%, Hungary on annual basis noted 88% and Turkey 91%. Surrounding countries shows that Montenegro stated 80% in using of ICT by household, North Macedonia 79%, and Bosnia & Herzegovina 73% (Eurostat, 2021).

On the other hand, data for using of the Internet by individuals in 2020. shows that dominant are Scandinavian countries – Island has 99% of using the Internet by individuals, Norway 98%, Sweden and Finland 97%. Also, Croatia noted 80% of individuals who use the Internet, Italy 81%, the Czech Republic 89%, Bulgaria 74%, Austria 89% and Romania 85% of individuals. Balkan countries have a lower percentage – North Macedonia 84%, Montenegro 79%, and Bosnia & Herzegovina 74%, and Serbia 80%. (Eurostat, 2021).

The aim of this paper then is to analyze ICT skills among all those active or inactive of working age in the labor market of the Republic of Serbia, with a focus on active and passive individuals on the labor market, by applying the results of cross-tabulation on microdata from survey ICT usage by individuals. This survey is conducted annually by the Statistical Office of the Republic of Serbia, according to the Eurostat methodology. Data covers the territory of the Republic of Serbia, without AP Kosovo & Metohija. The reference period was three months before the telephone interview (Yearbook of SORS, 2021). The results of this paper will be useful for the implementation of future strategies in the field of employment and ICT usage in the Republic of Serbia.

LITERATURE REVIEW

The digital economy is vital for innovation, economic growth, and employment. The spread of ICT has had a major impact on the labor market as well as what digital skills are essential to

function in the workplace and in society. The impact of ICT on the labor market is not universally the same by economy or sector (Picatoste et al., 2018). According to Valsamis et al, Scandinavia is a world leader in digital development, while newer EU member states and southern European countries lag far behind. According to the European Commission's Digital Agenda for Europe (2014), there has been a rapid rise in those who are online, yet almost 50% of all Internet users have insufficient ICT skills necessary to be competitive employees. The Digital Agenda also states that ICT skills must be treated as a priority. Therefore, a number of international strategies, policymakers and politicians have stressed the importance of digital skills to achieve competitiveness and sustainable goals (Agenda 2030). According to an OECD 2014. report, ICT skills among adults are of great importance as lacking such skills poses the biggest risk of losing one's jobs in the current workforce transformation (OECD, 2014). The same report states that adults are most at risk, as a significant number of them do not have computer and internet skills, while youth are generally familiar with computers and have wider access to the Internet at home (OECD, 2014). This highlights the potential skills mismatch between those who possess the strongest ICT skills, namely young people, and those who use them in the workplace. According to Bejaković and Mrnjavac (2020), digitalization of the economy causes market polarization, which has thus caused an increase in demand for those who have digital skills to successfully perform tasks dictated by new technologies. In 2006, Sung and Ashton (2006) in their study of 294 employers in the UK, pointed out that the adoption of ICT was vital in forming new work practices to allow for better communication, innovation, and support in the development of new products and services.

Murawski and Bick (2017) pointed out that many authors have highlighted the impact of ICT and digital transformation on external factors while neglecting the role of digital skills of the workforce in this process of change. In 2011, Brynjolfsson and McAfee concluded that the pace of technological innovations is proliferating, along with the use of advanced software technologies, thus turning workers without basic digital skills obsolete. In 2000, the UK government launched a life-learning program to increase the employment rate by acquiring and improving digital skills (Brown, 2000).

However, it must be noted that although there is the strive for every individual to possess ICT skills - that is not always possible. There are significant gaps in maintaining basic or advanced skills, and they are most often related to the age, gender, demographic characteristics, and education of individuals in the labor market. This situation creates a significant digital exclusion. According to Bejaković & Mrnjavac (2020), it could also increase social exclusion due to a lack of technological resources to teach digital literacy to the poor or marginalized groups. In this case, these groups of people risk remaining unemployed or losing jobs because they are becoming uncompetitive in the labor market.

When it comes to young people, authors state that they gain digital skills during formal and non-formal education (Van Dorsen, Van Dijk, 2014) and they manage well in the digital environment. However, youth employment is a global challenge. Although they are a part of the digital environment, not all young people have the skills needed in the digital economy. Young people in countries such as Norway, Finland, Sweden, Denmark, and Canada record a high level of use of ICT at home, but when it comes to using these technologies at work, the percentage is less than average (OECD, 2014). Therefore, it is necessary to strengthen their capacities through education and training for them to enter the labor market as ICT literate as possible.

On the other hand, if we consider the gender of the individuals in the labor market, numerous studies have shown a large gap in ICT literacy between the genders (Hafkin, Huyer 2007; Moghaddam, 2009; Wamala, 2012; Perifanou, Economides, 2020). Women had less access to the Internet and fewer Internet skills than men, while their reasons for using the Internet and computers were completely different (Fallows, 2005). Of course, this gap has narrowed over the years in developed countries, with slighter differences among the younger female population than the older female population. However, the majority of the 3.7 billion people that are not online are

female. The digital gender gap is still present in developing countries, thus creating a strong need for addressing the digital gender divide. According to ITU, on the global level, women and girls use the Internet 12.5% less than men and boys. In underdeveloped countries, only 15% of women used the Internet in 2019, compared to 86% of women in developed countries (ITU, 2021).

METHODOLOGY

Our research is based on the microdata of the survey *“The Usage of Information and Communication Technology on individuals/households in the Republic of Serbia for 2020”*. The data is provided by the Statistical Office of the Republic of Serbia (SORS) that carried out the first of such surveys in 2004. through a pilot survey. From 2006. to 2020, the survey was conducted annually following EUROSTAT methodology. The Usage of ICT is performed either by telephone or in-person interview. The aim is to provide data on the usage of information and communication technologies among individuals/households and enterprises in the Republic of Serbia.

The Statistical Office of the Republic of Serbia (SORS) carried out the same survey in 2020, splitting it into two forms: one on individuals/households and another on enterprises. The target population consists of households in which at least one member is between 16 and 74 years of age who are collected in a two-phase, stratified sample.¹ The three months preceding the telephone interview were taken to be the reference period, wherein the sample included 2800 households and 2800 individuals.

Furthermore, the survey was conducted based on a representative sample of 2800 households in the Republic of Serbia and whose response rate was 91.9% (2.574 households). The interview was done both by telephone but would allow for a third party to answer questions should the original interviewee be unavailable. There were a total of 2574 respondents, 1605 of whom were women and 969 men. By age, the majority were over the age of 55 (between 65 and 74 - 36.7% and between 55 and 64 - 22.2%). The smallest share was those between 16 to 34 years of age (roughly 13%). From all respondents, only 50.5% achieved a secondary-level education. Of the total number of respondents, approximately 32% were employed and 16.7% unemployed (table 1).

Table 1. Descriptive statistics

	NUMBER	%
INCOME		
Up to 300 euros	755	36.7%
300-600 euros	731	35.5%
More than 600 euros	573	27.8%
REGION		
Belgrade	611	23.7%
Vojvodina	735	28.6%
Šumadija and Western Serbia	701	27.2%
South and Eastern Serbia	527	20.5%
AGE		
16-24	151	5.9%
25-34	181	7%
35-44	319	12.4%
45-54	408	15.8%
55-64	571	22.2%

¹ The data does not account for any representation from the Autonomous Province of Kosovo.

65-74	944	36.7%
GENDER		
Female	1,605	62.4%
Male	969	37.6%
EDUCATION LEVEL		
Lower than secondary	432	16.8%
Secondary	1,300	50.5%
Tertiary	842	32.7%
EMPLOYMENT STATUS		
Employee	818	31.8%
Unemployed	430	16.7%
Student	52	2%
Other	1,274	49.5%
TOTAL	2,574	100%

Source: Statistical Office of the Republic of Serbia (SORS), 2020.

Since 2015, the Usage of ICT survey consists of on a comprehensive questionnaire grouped according to the following modules (Statistical Office of the Republic of Serbia-SORS, 2015):

- Module A: Access to information and communication technologies;
- Module B: Use of Computers and Internet;
- Module C: Use of e-government;
- Module D: Use of e-commerce;
- Module E: Privacy and protection of personal data;
- Module F: Trust, security and privacy;
- Module G: Internet of smart devices;
- Module H: Respondent's socio-demographic background information.

In our paper, through implementing a cross-tabulation, the data gathered was used to analyse differences in the ICT compared against those who were actively employed and those who were officially unemployed. We are focused on the usage of computers, mobile/cellular phones and the Internet (Module A and B). Module C of the same Survey tabulates e-government usage, e-trade and e-skills.

RESULTS

According to the date of SORS from 2020, the number of internet users increased in comparison with last 3 years. Additional, in 2020 more than 3.800.000 people aged between 16 to 74 used computers in the last three months or 78.4% of them. Comparing with last year, it is increased by more than 6.500 of individuals. In 2020, 72.4% of individuals used a computer, which is about 2 p.p. more than 2019.

Also, since 2018, the number of active internet users has increased among all regardless of whether the respondent was employed (both employee and self-employed), unemployed or a student.

The most significant rise in usage may be noted among the unemployed, whose computer use grew from 74.6% in 2018 to 83.6% in 2020. and their active internet use grew from 79.0% to 89.2% in the same time. Nevertheless, active internet use saw a substantial increase among the employed as well, growing from 89.7% to 96.3%.

Table 2. Computer and Internet users by employment status, 2018-2020.

	Working population	2018	2019	2020
Computer users (in the last 3 months) [%]	Total	70.7	71.9	72.4
	employed	86.8	90.3	92.7
	unemployed	74.6	77.1	83.6
	students	100.0	100.0	99.8
	other	44.0	45.3	52.3
Internet users (in the last 3 months) [%]	Total	73.4	77.4	78.4
	employed	89.7	93.3	96.3
	unemployed	79.0	83.4	89.2
	students	100.0	100.0	100.0
	other	45.5	53.6	60.4

Source: Statistical Office of the Republic of Serbia (SORS), 2020.

In Serbia, according to the data from 2020 (SORS, 2020), 81.3% of individuals never carried out learning activities over the Internet, 6.5% of them doing online courses and 4% of individuals had communication with instructors or students using websites or portals.

It can be seen in Table 3 that unemployed are most likely to neither seek any online learning materials nor to do an online course. While the overall percentage remains high for all groups as relates to their ever having carried out learning activities on the internet, it remains lowest for students (60.2%).

Both employed and unemployed are also most likely to have never carried out learning activities on the Internet (76.4%-employed and 84.5%-unemployed).

Table 3. Use of the internet, 2020.

Questions of Use of the Internet	EMPLOYMENT STATUS				
	Employee	Unemployed	Student	Other	Total
Which of the following learning activities have you carried out over the Internet for educational, private or professional purposes in the last three months?					
Doing an online course	8.1	5.7	17.1	4.3	6.5
Finding online learning materials (audio- visual materials. online learning software. electronic textbooks...)	22.7	13.5	37.2	12.7	17.4
Communication with instructors or students using websites or portals	4.9	3.0	9.6	3.3	4
Never carried out learning activities over the Internet	76.4	84.5	60.2	86.1	81.3

Source: Statistical Office of the Republic of Serbia (SORS), 2020.

The unemployed are also the least likely to purchase items online, where 34% have never done so. On the question “Which of the following activities did you perform over the Internet for private purposes?” in the sample, 83.3% of unemployed stated that they are using the internet for telephoning/video calls, or 88% of unemployed sending messages via WhatsApp, Viber, Skype. Unemployed are not interested in selling a good or product online or within e-banking. While about 30% of students and employed individuals are using e-banking for private purposes.

According to data, 97% of students telephoned over the Internet/video calls and 89.4% of students participate in social networks. Students are the most likely to use the Internet and other IT as they have the highest percentage overall of use which may also be evidenced by their frequency of purchasing items online (table 4). This may be biased due to the fact that students skew younger, and youth has been raised in an environment in which online purchasing is a norm in the target country as opposed to purchasing in person or through other means.

Table 4. Use of e-commerce, 2020.

Questions of Use of the E-commerce	EMPLOYMENT STATUS				
	Employee	Unemployed	Student	Other	Total
When did you last (for private purpose) buy?					
In the last three months	47.7	36.7	61.5	21.5	36.1
More than three months ago (less than a year)	14.5	13.6	6.8	8.3	11.8
More than a year ago	7.4	15.8	11.8	5.9	9.1
Never used it	30.3	34.0	19.8	64.3	43.0

Source: Statistical Office of the Republic of Serbia (SORS), 2020.

According to the data 2020, more than 1.415.000 individuals use websites/apps of public authorities to obtain information. Or to be more precisely, 34% of individuals obtain information from public authorities' websites, 25.2% downloading/print official forms and 23.9% send completed forms.

If we focused on individuals by employment status, both employed and unemployed benefit equally. According to data from 2020, 44.6% employed and 39.3% unemployed obtained information from public authorities' websites, while in downloading/printing official forms and sending completed forms employees are larger users than students and unemployed persons (table 5).

Table 5. Use of e-government, 2020.

Questions of Use of the E-government	EMPLOYMENT STATUS				
	Employee	Unemployed	Student	Other	Total
For which of the following public authorities' services have you used the Internet in the last 12 months?					
Obtaining information from public authorities websites	44.6	39.3	49.9	18.1	34
Downloading/printing official forms	35.5	27.5	26.7	12.9	25.2
Sending completed forms	33.9	26.7	25	11.7	23.9

Source: Statistical Office of the Republic of Serbia (SORS), 2020.

DISCUSSION AND CONCLUSIONS

Most authors have adhered to the conclusion that developing digital skills is the most important indicator for both European and global labor market development, which might improve economic growth and macroeconomic factors. Accordingly, international strategies, policymakers and politicians emphasize the importance of digital skills in order to achieve competitiveness and sustainable goals (Agenda, 2030). Our research conducted in the paper has focused on the characteristics of employed, unemployed and students, as well as to what extent they are users of ICT skills. According to the micro-data (2020), students (i.e. youth), are more likely to be beneficiaries of the ICT sector than either the employed and the unemployed. In Serbia there is not a large number of studies focusing on usage of ICT among the working population. One of them

is research conducted in 2012. Research on digital literacy evaluation was conducted within pharmacy based on a sample size of 1077 respondents (68% of them were employed within pharmacy and 32% were students) (Lakic et al., 2012). The research indicated that digital literacy among students was significantly higher than that of the employed. When removing students from the data set and then comparing the employed and unemployed, there is no substantial difference found in computer and internet use.

Use of e-government web services is almost present to the same extent among students, the employed and unemployed. However, unlike online shopping, students are most likely to use e-government services, even when the employed and unemployed both use online shopping equally.

Compared to EU countries, Serbia lags behind them in using ICT skills. Regardless of their status in the labor market, there are substantial distinctions between youth and older individuals, especially when it comes to advanced skills. This affects the creation of digital exclusion, which in turn increases the lack of resources that can be employed in better paid jobs. Those lacking digital skills are at a higher risk of remaining unemployed, or, when they do have a job, becoming unemployed, as not possessing digital skills makes them less competitive in the labor market. Similar to the rest of the world, the ICT sector is considered to be the most promising and fastest growing industry in Serbia which sets the trend for competencies required from university graduates in Serbia (Anđelković-Labrović et al. 2020). ICT companies tend to recruit graduates who possess specialized knowledge in ICT, management and economy, which calls for the implementation of multidisciplinary educational courses (FREN 2020). Accordingly, the Digital Serbia Initiative states that careers in digital business require specialized knowledge in "data analysis, bioinformatics, cloud computing, the Internet of Things, machine learning, artificial intelligence, virtual reality, as well as management, finance, accounting, marketing and entrepreneurship" (DSI 2020). Similarly, SMEs in Serbia look for candidates with compound skills. These include ICT skills, technical and social skills, foreign language skills, communication and negotiation skills as well as the willingness to work in a team and continuously improve one's knowledge. Therefore, in order to be competitive in the digital labour market, young graduates should develop a complex set of ICT and soft skills which conform to employers' requirements.

Technological innovation has been growing in pace with the use of advanced software technologies, making those who do not have basic digital skills more likely to become redundant in a competitive labour market. Life-learning programs have long been launched in developed EU countries in order to increase the employment rate through the acquisition and improvement of digital skills of individuals. Therefore, in order for digital skills to be advanced, especially among the unemployed, training needs to be introduced by the Government of the Republic of Serbia to ease entry into the labor market for the unemployed.

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