

Pursuant to Article 38, paragraph 1 of the Law on the Planning System (“Official Gazette of the RS”, No. 30/18),  
the Government adopts the

**STRATEGY  
OF DIGITAL SKILLS DEVELOPMENT IN THE REPUBLIC OF SERBIA  
FOR THE PERIOD 2020. TO 2024.**

**1. INTRODUCTION**

The Strategy of Digital Skills Development in the Republic of Serbia for the period 2020 - 2024. (hereinafter: Strategy) is a national strategic programme of the Government which comprehensively regulates the development of digital skills within the population with the aim of utilizing the potential of modern information and communication technologies in the direction of raising the quality of all citizens’ lives, higher employment, work efficiency and economic growth. Digital skills means the possession of appropriate knowledge, skills and conduct in accordance with the needs of individuals and the society under conditions of modern rapid ICT development in the 21st century.<sup>1</sup>

The Strategy reflects continuity and relies on the Digital Agenda for Serbia, which consists of the Strategy for the Development of the Information Society in the Republic of Serbia until 2020<sup>2</sup> and the Strategy for the Development of Electronic Communications in the Republic of Serbia for the period 2010-2020<sup>3</sup>. This strategic framework, together with the Strategy for the Development of Information Security in the Republic of Serbia for the period 2017-2020<sup>4</sup>, contributes to increasing access of citizens and the economy to information and communication technologies, openness and accessibility of the Internet, and creating an information society by developing e-business, e-commerce, e-justice, e-health and digital education. This development of the information society must necessarily be accompanied by the development of knowledge and skills related to information and communication technologies, which can be influenced by strengthening the role of ICT in education and training, involving all citizens in the information society, in particular citizens belonging to vulnerable groups, while providing an appropriate response to the needs of the labour market in terms of possessing appropriate digital skills, as well as by constant care for all aspects relating to security, privacy threats and technological dependence. The development of digital skills leads not only to the improvement of the quality of citizens’ lives, but also to the strengthening of local initiatives, regional development and the development of society as a whole.

The rapid development of new technologies conditions the need to use information and communication technologies in all segments of life. Monitoring ongoing digital transformation leads to the need to master new skills, while many services are increasingly only available

---

<sup>1</sup>[https://en.wikipedia.org/wiki/21st\\_century\\_skills](https://en.wikipedia.org/wiki/21st_century_skills), A common European response to shared goals A concept for tackling the digital skills challenges in Europe (<https://ec.europa.eu/digital-single-market/en/news/shared-concept-national-digital-skills-strategies>), [https://ec.europa.eu/knowledge4policy/online-resource/digital-skills-jobs-coalition\\_en](https://ec.europa.eu/knowledge4policy/online-resource/digital-skills-jobs-coalition_en)

<sup>2</sup>“Official Gazette of the RS”, number 51/10

<sup>3</sup>“Official Gazette of the RS”, number 68/10

<sup>4</sup>“Official Gazette of the RS”, number 53/17

through new technologies. By strengthening e-government, more efficient communication and functioning of institutions is achieved, which results in the efficiency of realizing certain rights. A large number of business entities operate electronically, which means not only electronic purchase and sale, but also in terms of organizing company business in a network environment and arranging business communication and customer care. Knowledge of the basic level of digital functioning is a prerequisite for communication, and most jobs require a certain level of digital skills among employees. The advantages of electronic in relation to traditional business are reflected in the increase of quality and efficiency, but also in the reduction of sales prices and decrease in time necessary for market placement and realization of various transactions. This situation requires that as many citizens as possible acquire knowledge, skills and abilities related to the use of digital devices, such as desktops, laptops, smartphones and similar devices, or gain appropriate digital skills, in order to find, analyse, evaluate, create and the transmit a wide variety of information in digital format.

The development of digital skills is a necessary response to the emergence of new technologies and their impact on the digital society and digital economy, and it implies skills needed for employment, productivity, creativity and success, along with information security and on-line security.

Numerous researches indicate that in the coming years there shall be more job openings for people who possess advanced digital skills. Demand for digital technology professionals has increased by 4% per year over the past ten years, while the number of vacancies for ICT professionals is expected to almost double by 2020. Most jobs already require basic digital skills. The use of ICT has increased significantly in the last five years for more than 90% of all jobs, and in the future almost every working position shall require digital skills<sup>5</sup>. In the European Union, almost half of the population does not have sufficiently developed basic digital skills, while about 20% of the population does not have digital skills at all, which is why it was concluded that EU Member States, companies and citizens must face the new situation and make efforts to acquire digital skills throughout the entire spectrum of education and training<sup>6</sup>. Basic digital skills include the ability to communicate via email or social networks, to create and edit an electronic document, as well as the capability of searching for information and protecting personal data on-line. Larger companies have greater needs to use digital technologies than smaller ones. It has also been estimated that the shortage of digital skills shall be greater in higher and secondary vocational education than for low-skilled jobs<sup>7</sup>.

Experts predict that advances in areas such as artificial intelligence, nanotechnology, 3D printing and other technologies shall lead to a new era that will radically change consumption, production and employment patterns, making digital skills an essential foundation of digital transformation. Furthermore, the growth of mobile broadband internet access ensures uninterrupted communication and participation of a large number of people in the digital economy.

---

<sup>5</sup><https://ec.europa.eu/digital-single-market/en/news/digital-skills-gap-europe>

<sup>6</sup><https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-381-EN-F1-1.PDF>

<sup>7</sup> <https://ec.europa.eu/digital-single-market/en/news/new-report-shows-digital-skills-are-required-all-types-jobs>

The answer to these challenges is to create opportunities for all segments of society to have access to news and information, communicate electronically with friends and family, use e-services on a daily basis (health, administration, finance, agro-technology, transport, and so forth) and benefit fully from of the modern digital society. Education in information and communication technologies is the basis of society's efforts to transfer knowledge and skills to its citizens that are related to computer and communication devices, software, as well as applications that work on them and systems developed from them.

In literature, a distinction is made between knowledge, skills and competencies. Knowledge is defined as “a set of facts, principles, theories and practical knowledge within the field of work or learning”. Skills refer to “the ability to apply this knowledge”, while competence is considered to be “the demonstrable ability to use all knowledge and skills for personal well-being”. Therefore, digital skills should be viewed more as practical and measurable outcomes of media, information and digital literacy<sup>8</sup>. Digital literacy models include knowledge, skills and competencies. In the literature taken into consideration, digital skills are defined more as a practical, measurable application of certain knowledge and skills in the use of digital, while digital competencies are considered as the ability to apply this knowledge and skills in different life contexts, from personal to professional. In this sense, digital literacy is a set of awareness, practical skills and competencies necessary for users to access, understand, evaluate, share with others and create digital content, in a planned and applicable manner, in order to meet personal and professional goals.<sup>9</sup>

Digital skills in modern conditions enable employment, productivity, creativity and success, especially of young people who regularly develop basic skills, as well as the opportunity to advance and gain higher levels of digital expertise, enabling them to participate in emerging industrial sectors and establish their own companies, namely making them competitive in the labour market. Knowledge of digital skills may be of various degree, from basic digital literacy needed by all citizens, to possessing competencies needed to perform specific jobs at the intermediate level and finally to possessing advanced specialized computer skills, as well as conducting scientific research in information technology and development.

The significance of digitalization has been recognized in the Republic of Serbia, resulting in reforms, economic growth, education and digitalization being among the main priorities of the Government in addition to integration into the European Union. The Economic Reform Programme for the period 2018-2020<sup>10</sup> proposes that the area of digitalization be a special area within the reforms process, which would be supplemented by “Digitalization in economic and non-economic activities”, bearing in mind the importance of digitalization as a creator of change in the modern world, and with the aim of removing the “digital divide”.

Having regard to the above, the Ministry of Trade, Tourism and Telecommunications, as the competent ministry, has formed a working group to draft proposals for this strategy, inter alia,

---

<sup>8</sup> Development of digital skills and competencies: A brief overview of the state of 13 digital literacy models, Katalina Jordake, Ilse Marjan, Dorin Balden, *Studies in Media, Innovation and Technology*, University of Vrije, Belgium, p. 65, available at the link: [https://www.nb.rs/view\\_file.php?file\\_id=5610](https://www.nb.rs/view_file.php?file_id=5610)

<sup>9</sup>Ibid., pg. 67.

<sup>10</sup>Available at:<http://www.mfin.gov.rs/UserFiles/File/strategije/2018/ERP%202018-2020%20SRB%20FINAL.pdf>

for the purposes of performing activities in the field of information society relating to proposing policies and strategies for information society development, implementing measures to encourage research and development in the field of information society, preparing regulations, standards and measures in the field of information society and information and communication technologies, as well as applying information and communication technologies. In addition to the representatives of the competent ministry, the Working Group also included representatives of the Ministry of Education, Science and Technological Development, the Ministry of Culture and Information, the Ministry of Public Administration and Local Self-Government, the Office for Information Technology and E-Government, as well as the representatives of the professional public, such as Serbian Academy of Sciences and Arts, Petnica Research Station, two faculties of the University of Belgrade and the Mathematical Gymnasium. A representative of the Commissioner for the Protection of Equality, as well as representatives of other bodies and organizations, the professional and academic community and the civil sector, contributed to the drafting of this strategy by participating in the focus group that brought together stakeholders in this area.

Support for the development of this strategic document was provided by the Organization for Security and Co-operation in Europe (OSCE) through expert engagement in the drafting of a strategic chapter related to ICT professionals. The preparation of this document was preceded by an ex ante analysis that includes the following: analytical report of the IT market in Serbia 2017-2019, Development of information technology industry and ICT education and staff conducted by Mineco Computers, Research of European children on the Internet - Use of the Internet and digital technology by children and youth in Serbia, conducted by the Institute of Psychology of the Faculty of Philosophy in Belgrade<sup>11</sup>, and a Comparative analysis of international experience and good practice on child safety on the Internet and ways of using the digital world, conducted by UNICEF in the Republic of Serbia. Young people were also involved in the analytical process of drafting this document, through a survey on the topic “Digital Skills”, conducted through a digital social platform in the Republic of Serbia called “U-Report”, the data of which is managed by UNICEF. This survey was conducted in order to examine the level of digital skills among young people, how available they are to them and what their suggestions are in relation to digital skills development. Moreover, as part of the ex ante analysis, a survey to identify the needs for digital skills among employees as a result of changes that are being inevitably imposed by the digital transformation of the work environment was conducted by a research team within the USAID Project "Cooperation for Economic Development", in collaboration with the Ministry of Trade, Tourism and Telecommunications.

In view of the Republic of Serbia’s commitment to integrate into the European Union, the Strategy follows the areas defined by the New Skills Agenda of the European Union, taking into consideration the current state of digital skills in the Republic of Serbia, various statistics, forecasts and predictions regarding future development of this sector and the need for possessing digital skills to the appropriate extent. In the process of drafting this strategy, the situation in this

---

<sup>11</sup> The realization of this research was supported by the Ministry of Trade, Tourism and Telecommunications, the Ministry of Education, Science and Technological Development, the UNICEF Office in Serbia, the Organization for Security and Co-operation in Europe (OSCE) and the Department of Media and Communications of the University of Oslo.

area in the European Union was reviewed with reference to the EU legal framework, as well as the result achieved so far in the implementation of the existing legal framework in the Republic of Serbia. From this observed situation, conclusions were drawn regarding the directions of development and fields of knowledge in terms of digital skills, as well as concerning the goals that must be achieved in the coming period, while measures and activities for achieving these goals and key performance indicators and a plan for monitoring the implementation of the Strategy have been determined.

## **2. MISSION AND VISION**

The mission of the Strategy is to improve the system that is used to achieve the acquisition of greater digital skills among citizens by developing computer thinking, providing skills necessary for everyday life and developing a successful career in the digital economy, as well as ensuring conditions for further improvement of knowledge and skills of ICT professionals. Research indicates that in the coming years, there shall be an increase in jobs globally for people with advanced digital skills, with a tendency for this trend to accelerate. What is crucial to a strategic approach to any challenge in the field of digitization, including digital skills, is comprehension of the characteristics of “digitization” characterized by speed and change. Consequently, the creation of a five-year strategic document in the field of digital skills development requires an appropriate approach that allows the long-term mission of the Strategy to include continuous development of awareness regarding the need for active adaptation to changes, through continuous and effective learning.

The vision of the Strategy is to improve digital skills through joint cross-sectoral engagement on raising awareness in this area and improving knowledge and skills in order to monitor the development of new technologies. The vision is focused on a longer period than the period of implementation of the Strategy, as in that manner the necessary conditions for the development of the entire society are achieved.

Given the extent to which digital skills influence every aspect of work and life, covering different areas - education and skills development, labour market, competition, science, technology and innovation, as well as trade and industrial policies, the vision of the Strategy implies effective cross-sectoral cooperation and use of all available resources.

## **3. OVERVIEW AND ANALYSIS OF CURRENT STATE-OF-PLAY**

### **3.1. Data on the use of ICT in the Republic of Serbia**

Data on computer literacy in the Republic of Serbia, which is regularly published by the Statistical Office of the Republic of Serbia in statistical yearbooks, show that 34.2% of persons

aged 15 and over are computer literate, while 14.8% of these persons are partially computer literate. Observed by gender, the share of men and women is almost equal among computer literates (50.4% of the men and 49.6% of the women are computer literate), while the share of women (54%) among computer illiterates is larger than among men (46%).<sup>12</sup> Computer literate are those persons who are able to perform four basic activities on a computer, as follows: word processing, spreadsheets, sending and receiving e-mails and using the Internet. Persons who partially know how to work on a computer are persons who can perform one, two or three activities on a computer, but not all four listed, while computer illiterate persons are persons who cannot perform any activity on a computer. This data indicates the number of persons who need to be provided with digital literacy at least at the basic level, given that computer illiterate persons in the Republic of Serbia account for 51%.

	<b>Women</b>	<b>Men</b>	<b>Total</b>
Computer literate	49.6%	50.4%	34.2%
Partially computer literate	49.1%	50.9%	14.8%
Computer illiterate	54.0%	46.0%	51.0%

The Statistical Office of the Republic of Serbia, considering the importance of development and use of information and communication technologies in the modern “information society”, its role in production and economy, as well as in all other spheres of life of individuals and society as a whole, regularly conducts research on the use of information and communication technologies by households and individuals and special research on the use of information and communication technologies that includes companies.<sup>13</sup> The results of the aforementioned research provides a picture of the situation in terms of access to computers and the Internet, as well as the way they are used, depending on the area, level of education, income, and so-forth.

According to the results of the research on the use of information and communication technologies by households and individuals from 2018, 72.1% of households in the Republic of Serbia own a computer. The prevalence of computers in households varies, so in Belgrade it amounts to 81.1%, in Vojvodina 69.3%, and in central Serbia 69.0%. The representation of computers also varies when comparing urban (78.2%) and other parts of Serbia (61.8%), and compared to 2017, namely this gap has slightly increased and the growth rates of computer representation compared to 2017 in urban areas is 4.7%, and in other parts of the Republic of Serbia 1.1%. However, the largest gap in terms of the representation of computers in households is visible in the structure of households according to monthly income. A computer is mostly

<sup>12</sup>“Statistical Yearbook of the Statistical Office of the Republic of Serbia for 2018”, Statistical Office of the Republic of Serbia, Belgrade 2018, available at: <http://publikacije.stat.gov.rs/G2018/Pdf/G20182051.pdf>

<sup>13</sup>“Usage of information and communication technologies in the Republic of Serbia, 2018”, Statistical Office of the Republic of Serbia, Belgrade 2018, <http://publikacije.stat.gov.rs/G2018/Pdf/G201816013.pdf>

owned by households with a monthly income exceeding EUR 600 (87.9%), while the share of households with an income of up to EUR 300 is 54.8%.<sup>14</sup>

Furthermore, according to the results of this research, in the Republic of Serbia, 72.9% of households have an Internet connection. As with representation of computers in households, there is a large gap in relation to monthly income: 87.8% of households with a monthly income exceeding EUR 600 have an Internet connection, while the share of households with an income of up to EUR 300 in this regard is 56.8%.<sup>15</sup>

Data related to computer usage show that 70.7% of people have used a computer in the last three months, while 22.8% have never used a computer. Each or almost every day, a computer is used by over 3,108,000 people. Compared to 2017, the number of people who used a computer each or almost every day decreased by a little over 10,000.<sup>16</sup>

In the last three months, 73.4% of the respondents used the Internet, while as many as 24.2% never used the Internet. Data on the share of Internet users (in the last three months), according to the level of education, indicate the need for future action, bearing in mind that the Internet was used by 90.8% of the population with higher and university education, 83.0% of people with secondary education and 46.9% of persons with lower than secondary education.<sup>17</sup> Internet e-government services are used by 37.3% of the Internet population instead of making personal contacts or visiting public institutions or administrative bodies.

As regards to e-commerce, 30.9% of the users have shopped/ ordered on-line in the last three months, 14.6% more than three months ago, and 9.1% more than a year ago, while 45.4% of Internet users have never purchased/ ordered goods or services on-line. Data from the Statistical Office of the Republic of Serbia indicated that in 2018, over 1,800,000 consumers purchased goods/ services on-line. This data also shows how much room there is for future action in this field, in particular having regard to the unstoppable growth of both the global and domestic e-commerce market.

Regarding the possibility of acquiring knowledge in order to improve skills related to the use of computers, software or applications in the last year, according to the 2018 survey, 12% of Internet users used free on-line training or self-study, while 4.1% were covered by training paid for or provided by an employer.<sup>18</sup>

The results of the research on the use of information and communication technologies in companies show that 99.3% of companies within the territory of the Republic of Serbia use a computer in their business operations, and 99.8% of companies have an Internet connection. ICT experts are employed by 20.7% of the companies, 76.5% of the large companies, while this percentage is 14.5% for small undertakings.<sup>19</sup> Only 26.3% of the companies in 2017 received

---

<sup>14</sup>Ibid., pg. 12-13

<sup>15</sup>Ibid., pg. 14

<sup>16</sup>Ibid., pg. 18, 21

<sup>17</sup>Ibid., pg. 23

<sup>18</sup>Ibid., pg. 34

<sup>19</sup>Ibid., pg. 77.78

orders (excluding email orders) via the Internet.<sup>20</sup> Regarding the share of part of the total turnover realized on the basis of orders received via the Internet, about 13% of the enterprises realized more than half of the total turnover via the Internet, while 72.5% realized less than 24% of the turnover via the Internet. Social networks are increasingly present in companies' business operations, which is supported by data from 2017 that 39.7% of companies used a certain social network for the needs of their business.

The situation in this area is considered in the analysis “On the Road to Prosperity 4.0 - Digitalization of Serbia”<sup>21</sup>, which notes that, although Serbia started adopting ICT relatively late, which is a result of late transition and closed economy during the 1990s, the population shows great interest in the use of ICT products and services, in particular after 2005. It is positive that the population in the Republic of Serbia very quickly and spontaneously accepts new information and communication technologies, which is partly due to activities of various entities (e.g. computer training courses, etc.) or to the competition itself in certain fields (e.g. mobile telephony). Considering that after 2005, the ICT infrastructure in the Republic of Serbia is being repaired and that increasingly more modern equipment is being procured, the acceptance of ICT products from an increasing part of the population creates preconditions for further accelerated development of the information society.

The same research notes that, on the other hand, there are certain factors that can be characterized as shortcomings in relation to the faster development of the information society. This primarily refers to the high costs of Internet access, insufficient participation of the population with higher education and the low level of electronic content on the Internet in the Serbian language. All this further complicates the expansion of Internet and e-commerce usage. Inadequate ICT equipment in educational institutions and an insufficient number of educational staff with appropriate ICT skills adversely affect the development of the digital economy in the Republic of Serbia. According to research, 47% of teachers assess the level of ICT equippedness in schools as satisfactory, while more than half of them have almost no access to digital classrooms or use them less than once a month.<sup>22</sup> Although the business sector in the Republic of Serbia is relatively well supplied with ICT equipment, these capacities are insufficiently exploited exactly due to an insufficient level of interdisciplinary knowledge and skills among employees.

According to the same report, the educational level of the labour force in the Republic of Serbia, observed as the average number of years of schooling or as participation of employees with higher education, shows a positive growth trend after 2000. On the one hand, the advantages of the Serbian economy are reflected in the fact that a large number of students are enrolled in technical faculties where they study and acquire digital knowledge and skills, but, on the other hand there, is still a negative trend of gradual reduction or stagnation as regards the number of

---

<sup>20</sup> Ibid., pg.81-83

<sup>21</sup> “On the Road to Prosperity 4.0 - Digitalization of Serbia”, Friedrich Ebert Foundation May 2017, available at: <http://library.fes.de/pdf-files/bueros/belgrad/13415.pdf>

<sup>22</sup> Džigurski S., Simić S., Marković S., Šćepanović D. (2013). Research on the use of ICT in schools in Serbia. The Government of the Republic of Serbia and the Social Inclusion and Poverty Reduction Unit. <http://socijalnoukljucivanje.gov.rs/wp-content/uploads/2014/06/Istrazivanje-opotrebi-IKT-u-skolama-u-Srbiji-jun-2013.pdf>

students enrolling into natural sciences faculties. According to the data of the Statistical Office of the Republic of Serbia, 251,162 students enrolled at faculties over the course of 2015, but out of that number, 7.7% enrolled in computer science courses.

Over the course of the same school year, 5% of graduate students in the Republic of Serbia completed their faculty studies in the field of ICT, while 4.5% of them graduated from a faculty of natural sciences and mathematics. The report “On the Road to Prosperity 4.0 - Digitalization of Serbia” states that, according to recent research, approximately 1,000 information and technology experts are trained annually in the Republic of Serbia. In terms of the acquired level of basic ICT skills, it is higher among the younger population compared to the older population. The current level of education, in particular of the older population, does not allow for the easy and simple mastering of the digital economy. The obsolescence of certain educational programmes is one of the biggest weaknesses in transitioning to the information society, together with insufficient funds that the state allocates for higher education. Modern educational concepts in the digital segment and the field of economics require very close cooperation between the academic and business sectors. The low level of such cooperation and the lack of motivation for its improvement represent a significant threat to successfully adapting the education system to the needs of digital society development.

In modern society, the role of the digital environment, freedom of expression, protection of privacy, new media and digital security is becoming increasingly vital. The report *Monitoring digital rights and freedoms in Serbia*<sup>23</sup> states that in the Republic of Serbia, slightly more than 64% of the population has access to the Internet, but official statistics undoubtedly indicate that the so-called digital divide, a socio-economic risk that threatens free and balanced access to digital technologies, is increasing. Within society, these differences are most pronounced in relation to persons with disabilities, the Roma population and the population in rural areas. Thus, the data from the Report on Digital Inclusion show that 90.2% of the total number of people with disabilities do not use computers and the Internet. Differences can be noticed when comparing the representation of computers in urban and rural parts of the Republic of Serbia: 73.3% vs. 54%<sup>24</sup>.

AS regards the IT market, research results<sup>25</sup> indicate that after 10 years of stagnation, in 2018 the IT market exceeded the value of half a billion Euro, namely that the value of the domestic IT market in 2018 was estimated at EUR 522.7 million, which represents an annual growth of 8%. The markets for software and IT services in the Republic of Serbia are reaching double-digit growth, which may be perceived as an indicator of somewhat faster development of the IT market and an initial phase of releasing large, untapped potential. From year to year, IT services recorded an increase from the initial EUR 71.7 million to EUR 202.6 million in 2018,

---

<sup>23</sup> *SHARE@WORK 2016* - Monitoring digital rights and freedoms in Serbia, SHARE Foundation, May 2017 - Available at: [https://labs.rs/Documents/Monitoring\\_digitalnih\\_prava\\_i\\_sloboda\\_izvestajza\\_2016\\_srb.pdf](https://labs.rs/Documents/Monitoring_digitalnih_prava_i_sloboda_izvestajza_2016_srb.pdf)

<sup>24</sup> *Ibid.*, pg. 10-11

<sup>25</sup> The research was conducted by MINECO Computers, a consulting and analytical company in the field of ICT, Milovan Matijević, IT market of Serbia 2017-2019, Development of the information technology industry and ICT education and staff

whereby the value of IT services in 2018 was 280% of its value in 2006. For faster and more efficient IT growth in the Republic of Serbia, the beginning of negotiations for Serbia's accession to the EU and meeting the standards in all 35 areas is of great significance. Namely, IT permeates all areas, and without IT support it is impossible to imagine the functioning of modern life, education, health and other fields. Over the course of 2017, 2,163 companies with an individual operating income of more than RSD 1 million operated in the domestic IT industry, employing a total of 25,890 workers (of which over 60% are IT experts), or about 1.6% of the total number of employees in the Republic Serbia, which is 74% more than in 2011. Although small and medium enterprises (SMEs) make up just over a fifth of the total number of IT companies, they account for two thirds of the total business activity of the domestic IT market in terms of income, employees, capital and profit, while the remaining third is equally shared by 1,680 micro firms and 10 large IT companies, on the other hand. The key advantage that enables growth to almost all domestic IT exporters is global demand, which is practically infinite. Thus, in 2015, 188 programming companies were founded, in 2017 there were 253, and only in the first 11 months of 2017, 261 programming companies were established. However, out of a total of 659 programming companies established in the period from 2015 to 2017, 250 did not generate income or employ workers. In the field of informatics and engineering, the representation of women in total employment is 15-20%, whilst achieving a balance in gender representation in these areas is a challenge not only in our country, but also in the European Union.

The importance IT sector development was recognized with the adoption of the Strategy for Development of the Information Technology Industry for the period 2017-2020<sup>26</sup>, which contains measures to improve the business conditions of domestic IT companies, encourage the establishment of new companies and production of own products.

The survey ICT education and staff<sup>27</sup> notes that when observing education and needs, the total number of ICT students in the European Union in 2016 was estimated at about 1.5 million (about 250,000 graduates per year), while the needs are estimated at about 2 million by 2022, indicating a shortage of about 435,000 experts. The same research states that a total of 5,288 ICT experts graduated in the Republic of Serbia in the same year (2016).

ICT classes are held at 53 educational institutions, 14 within the auspices of state universities, 18 at private universities and 21 in colleges. It is further stated that in 2017, the number of newly enrolled ICT students (10,605) in relation to the total number of first-year students (53,153) was almost 20%, which confirms that the interest of young people in ICT studies is growing. According to the same research, the projection is that over 30 thousand ICT professionals shall graduate in the Republic of Serbia in the period 2017-2022 and that domestic needs are estimated at less than 15 thousand professionals, which can lead to a modern form of labour migration, or employment abroad, and, thanks to the development of ICT, in particular the Internet, residence in the country. What is positive to mention is that the representation of the female population in ICT studies in the Republic of Serbia is 28%, which is 7 percentage points more than the average in the European Union (21%).

---

<sup>26</sup>“Official Gazette of the RS”, number 95/16

<sup>27</sup> The research was conducted by MINECO Computers, a consulting and analytical company in the field of ICT, Milovan Matijević, ICT education and higher education staff in 2017-2018

The results of all these studies deal with the situation and needs, as well as opportunities available in the coming period, or space for action as regards to citizens, but also with companies, in particular if we take into account the data on the representation of computers in urban and other areas, the gap in the representation of computers in households in relation to monthly income, the number of people who have never used a computer and the Internet, especially among people with lower than secondary education, the number of employed ICT professionals in relation to enterprise size and the share of total turnover realized on the basis of orders received via the Internet, as well as the growth of the IT market and the number of companies, with an overview of the situation regarding the education of IT professionals in Serbia.

### 3.2. International framework for digital skills development

Ensuring sustainable development and a secure future is a basic commitment of the European Union, defined by the European Commission document “Europe 2020: A strategy for smart, sustainable and inclusive growth”<sup>28</sup> (Europe 2020 Strategy), which represents a vision of creating new, secure jobs and a better life for all citizens. The Europe 2020 Strategy aims at knowledge-based economic development of the European Union, while preserving the environment, a high level of employment, productivity and social cohesion, and is based on three pillars: 1. smart growth with a focus on education and innovation (scientific and technological research and development, innovation, education and digital society); 2. sustainable growth, which implies competitiveness and production that is more efficient in terms of resources, and 3. inclusive growth, through better participation in the labour market, combating poverty and social cohesion. Education is one of the central themes of the Europe 2020 Strategy. Out of a total of seven initiatives, education directly permeates at least three (Youth on the move, An Agenda for new skills and jobs, European platform against poverty), and is indirectly linked to the other four, given that knowledge is one of the basic resources for progress and development. . One of the flagship initiatives of this strategy is the Digital Agenda, aimed at developing the digital single market and promoting its benefits for businesses and households, which supports the development of high-speed internet and broadband internet access for all.

In order to implement the Europe 2020 Strategy, the EU Council has adopted ten integrated guidelines that should ensure the realization of strategic goals. These guidelines relate to economic policy (optimizing support for research and development and innovation, strengthening the knowledge triangle and unlocking the potential of the digital economy) and employment policy (increasing labour market participation and reducing structural unemployment due to the gap between supply and demand; developing a skilled labour force responding to the needs of the labour market, improving the quality of work and lifelong learning; improving the performance of education and training systems at all levels and increasing participation in higher education; promoting social inclusion and combating poverty).

---

<sup>28</sup>A *European strategy for smart, sustainable and inclusive growth*, available at: <http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>

The Europe 2020 Strategy incorporates the goals of sustainable development of the UN 2030 Agenda<sup>29</sup>, which include the mobilization of all resources in the country in order to eradicate poverty, combat inequality and find a response to climate change. Sustainable Development Goals (also known as the Millennium Development Goals) recognize that the fight against poverty involves economic growth and industrialization, as well as meeting a number of social needs including health, education, social protection, a healthy environment, and a climate resilient community.

An overview of the goals and principles of sustainable development in the European Union, namely of the development agenda and EU priorities, is incorporated in the New Skills Agenda for Europe<sup>30</sup> of the European Commission (“An Agenda for new skills and jobs: A European contribution towards full employment”). This document encourages Member States of the European Union to develop their own comprehensive digital skills development strategies. The New Skills Agenda for Europe provides guidelines for addressing challenges in this area and potential solutions for national strategies, focusing on four priorities: 1. Better functioning of the labour market by improving the so-called flexicurity policy, namely by establishing a balance between the flexibility of labour legislation and guaranteeing safety for workers; 2. Better trained workforce, namely increasing the skills and knowledge of the workforce to adapt to new technologies and work environment dynamics, which is conditioned by the connection between education and labour market needs, as well as by anticipating future labour market needs and implementing active employment policy measures; 3. Higher quality of jobs and working conditions and 4. Policy of job creation and labour force demand. Successful implementation of the New Skills Agenda for Europe requires a combination of policy implementation instruments at all levels of government.

The objectives of the New Skills Agenda for Europe are set out in the European Commission Communication on Next steps for a sustainable European future - European action for sustainability<sup>31</sup>. This document covers priority areas related to the following: 1. education and training; 2. citizens; 3. workforce and 4. ICT professionals. New, digital technologies are used in a large number of sectors such as agriculture, health, transport, education, trade, energy, shipping, logistics and the information and communication technology industry, whilst digital skills are needed in all segments and in response to such a situation, within national strategies, it is necessary to anticipate the directions of development in all four areas.

The Europe 2020 Strategy is not only important for Member States of the European Union, but also represents a significant potential for candidate countries and potential candidates for membership in the European Union to provide direction to their reform processes. The goals of the Europe 2020 Strategy are at the same time the development priorities of the Republic of

---

<sup>29</sup> entered into force on 1 January 2016 after the adoption of a resolution at the UN Summit in September 2015 - this is a global development agenda for the period after 2015

<sup>30</sup> A common European response to shared goals A concept for tackling the digital skills challenges in Europe, available at: <https://ec.europa.eu/digital-single-market/en/news/shared-concept-national-digital-skills-strategies>

<sup>31</sup> COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, Next steps for a sustainable European future European action for sustainability, available at: [https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122\\_en.pdf](https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122_en.pdf)

Serbia and other countries of the Western Balkans. The document Serbia and Agenda 2030 - Mapping the National Strategic Framework in Relation to Sustainable Development Goals<sup>32</sup> states, among other things, that the process of prioritization and nationalization of sustainable development goals in the Republic of Serbia should follow the same principle and standards established within the European Union.

Among the 17 Sustainable Development Goals of the 2030 Agenda are goals directly or indirectly related to the reasons for adopting this strategy, which correlate to poverty reduction, inclusive and quality education and promoting lifelong learning opportunities, achieving gender equality, promoting strong inclusive and sustainable economic growth and decent employment for all, promoting sustainable industrialization, reducing inequalities within and between countries, and advancing and use of innovative technologies and ICT. Special emphasis is placed on Goal 17 - Partnerships for the goals, in view of the fact that funds are crucial for the implementation of the 2030 Agenda. In terms of the global partnership for sustainable development, the Republic of Serbia is involved in numerous regional initiatives, and since 2017 it has been part of the Regional Economic Area, when six leaders from the Western Balkans supported the Multi-Annual Action Plan for Regional Economic Area in the Western Balkans (MAP), which consists of four dimensions: trade, investment, mobility and the digital market.

The European Union South East Europe 2020 Strategy<sup>33</sup> is a response to the Europe 2020 Strategy, which includes specific priorities of seven countries located in the region of South East Europe (Bosnia and Herzegovina, Croatia, Montenegro, Serbia, Northern Macedonia, Albania and Kosovo\*) and forms the basis for defining the development path of these countries under the framework of the accession process to the European Union. This strategy envisages development pillars, including smart growth with four dimensions, as follows: human resource development, research, development and innovation, the digital society and culture, and creative sectors.

The Multi-annual Action Plan (MAP) for a Regional Economic Area (REA) in the Western Balkans<sup>34</sup> should enable the smooth flow of goods, services, capital and skilled labour, making the region attractive for investment and trade and accelerating rapprochement with the European Union. The plan contains four thematic priorities (trade, investment, mobility and the digital market) among which the digital dimension covers roaming and broadband internet access, cyber-security and data protection, as well as the improvement of digital skills throughout the region.

High-speed internet access, cheaper roaming, advancing innovation, strengthening cyber-security and the digital economy are the backbones of the EC's Digital Agenda for the Western Balkans. The digital economy in the Republic of Serbia is growing rapidly, and the export of the IT sector is constantly increasing, so it is necessary to invest in the development of digital skills, e-government, programming studies and so-forth. The area of digitalization is an opportunity for economic development, and one of the key elements in the Strategy for the Western Balkans is

---

<sup>32</sup>Public Policy Secretariat of the Republic of Serbia, <https://rsjp.gov.rs/wp-content/uploads/2017/11/Agenda-UN-2030.pdf>

<sup>33</sup>Adopted at the Western Balkans Ministerial Conference in November 2013

<sup>34</sup> concluded in 2017 in Trieste by six leaders from the Western Balkans as part of the Regional Economic Area

\* This does not prejudice the status of Kosovo and Metohija and is in line with Resolution 1244

digitalization, which implies the area of cyber-security. A particularly crucial segment is the development of digital skills, due to the fact that some estimates indicate that after 2020, 80% of jobs shall require digital literacy. The development of creative industries is also significant, as well as the development of small and medium enterprises in that area. In addition to the above, there are other documents relevant to this area, such as the Digital Education Action Plan, which includes the countries of the Western Balkans<sup>35</sup>.

### 3.3 Legislative and institutional framework in the Republic of Serbia and directions of action

Aligning the political and regulatory framework for electronic communications with the European Union framework, the Digital Agenda for the Republic of Serbia is defined, as already emphasized, by the Strategy for Development of the Information Society in the Republic of Serbia until 2020<sup>36</sup>, the Strategy for Development of Electronic Communications in the Republic of Serbia for the period 2010-2020<sup>37</sup> and the Strategy for the Development of Information Security in the Republic of Serbia for the period 2017-2020<sup>38</sup>. Furthermore, back in 2009, the Republic of Serbia adopted the Strategy of transition from analogue to digital broadcasting<sup>39</sup> and other regulations and action plans relevant to this area.

Two important laws were adopted - the Law on Electronic Document, Electronic Identification and Trust Services in Electronic Business<sup>40</sup> and the Law on Electronic Government<sup>41</sup>, which regulate the performance of administrative tasks by state authorities and organizations, provincial autonomy and local self-government unit bodies and organizations, institutions, public enterprises and other legal and natural persons entrusted with public authorization to use information and communication technologies, namely governing conditions for the establishment, maintenance and use of interoperable information and communication technologies by authorities.

The condition for effective performance of work in relation to all executive and managerial positions in state administration is the possession of Digital Literacy competences, as one of the general functional competencies determined by the Regulation on determining competences of civil servants<sup>42</sup>, which is checked during employment. It consists of the following areas of knowledge and skills: Basic knowledge of working on a computer, Basic knowledge of Internet use, Word processing, Spreadsheets. Depending on the tasks of individual posts, one of

---

<sup>35</sup> EU, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digital Education Action Plan, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018DC0022&from=EN>

<sup>36</sup>“Official Gazette of the RS”, number 51/10

<sup>37</sup>“Official Gazette of the RS”, number 68/10

<sup>38</sup>“Official Gazette of the RS”, number 53/17

<sup>39</sup>“Official Gazette of the RS”, no. 52/09, 18/12 and 26/13

<sup>40</sup>“Official Gazette of the RS”, number 94/17

<sup>41</sup>“Official Gazette of the RS”, number 27/18

<sup>42</sup> “Official Gazette of the RS”, number 4/19

the special functional competencies may include specific knowledge related to the use of relevant software (E-inspector, Unified Information System for Policies, and so-forth). The Regulation also prescribes specific areas of knowledge and skills for employees who perform IT tasks within the state administration relating to databases, resource sharing systems, IT security, programming language, etc.

The Electronic Government Development Strategy of the Republic of Serbia for the period 2015-2018<sup>43</sup> envisages the development of the information society in the areas of public administration, health, education, judiciary, social policy, public procurement, participation in decision-making, data security and electronic transactions, availability and accessibility, security of personal data, as well as the development and use of open data owned by public authorities, which have been created over the course of their work or in connection with their work. This strategy determined the basic goals and priorities for improving the state of e-government in the Republic of Serbia, which also includes technical support to the Public Administration Reform Strategy in the Republic of Serbia<sup>44</sup>, with which it is closely connected. State authorities are networked and an increasing number of services can be provided electronically. Thus, health booklets are being verified electronically, state authorities' databases are connected, an e-baby project has been launched in maternity hospitals, e-prescriptions are being issued, an e-court project is being implemented, and so-forth.

Commitment to the development of e-government and digitalization was also expressed by the establishment of the Office for Information Technologies and e-Government<sup>45</sup>, which began operating in 2017 by taking over the rights and obligations from the Directorate for E-Government. The Office performs professional tasks related to, among other things, support in the application of information and communication technologies within public administration bodies and government services, design, development, construction, maintenance and improvement of the computer network of republic bodies; it also performs tasks for the Centre for the Prevention of Security Risks in ICT systems within national bodies (CERT for national bodies), providing services of design, development and functioning of Internet access, internet services and other centralized electronic services, as well as other prescribed tasks.

At the end of 2017, the National Academy for Public Administration was established by law as the central institution of the system for professional training in public administration, with the status of a special organization, taking over the rights, obligations and cases from the Human Resources Management Service, which, among others, continuously prepared and implemented training programmes in order to improve the digital skills of employees since 2007. Since its establishment, the National Academy for Public Administration, both at the level of public administration and at the level of local self-government, has realized 42 courses, which were successfully completed by 655 participants (executors and managers). The trainings were realized by trainers accredited within the field of professional training for e-Government and

---

<sup>43</sup>“Official Gazette of the RS”, number 107/15

<sup>44</sup>“Official Gazette of the RS”, no. 9/14, 42/14-correction and 54/18

<sup>45</sup>Regulation on the Office for Information Technologies and e-Government (“Official Gazette of the RS”, No. 73/17)

digitalization. Training programmes for improving the digital skills of civil servants, prepared and implemented by the National Academy for Public Administration, contribute to the development of digital competencies, special functional competencies in the field of IT work and skills for using certain software for a specific job.

The Government has also established the Council for Innovative Entrepreneurship and Information Technology, which, among other things, has tasks related to systemic development and improvement of the IT sector and development of innovative entrepreneurship, improvement of business conditions and conditions for Internet entrepreneurship development, systemic development and training of professional staff in the field of information technologies and innovative entrepreneurship. In its Plan of priority goals and activities of public administration bodies and government services for the improvement of the IT sector in the Republic of Serbia for 2019 and report from 2018<sup>46</sup>, the Council for Innovative Entrepreneurship and Information Technology provided an overview of the situation in the Republic of Serbia regarding the IT sector. Thus, this plan states that the information and communication technology sector is one of the largest sectors in the Republic of Serbia and one of the largest net exporters. According to data of the National Bank of Serbia, in the first 11 months of 2018, the export of ICT services exceeded the value of exports of EUR one billion, with a growth of 27.5% compared to 2017. The surplus of exports of ICT services makes up the majority of the surplus of exports of services, while the sector itself has recorded a constant growth of exports of over 20% over the last decade. The average salary per employee in the ICT sector is over twice as high as in other industries, while one job in the ICT sector creates 4-5 jobs in other sectors.

The Government's website dedicated to IT retraining<sup>47</sup> states that the sector currently employs about 20,000 workers, with three times the average salary compared to other industries. The potential of this sector for expanding, as well as for attracting new companies and creating an environment that would enable the opening of a larger number of start-up companies has been examined, taking into consideration that each worker in the IT sector contributes to the export of the Republic of Serbia with about EUR 40 thousand per year. This sector also has a tendency to develop entrepreneurship, in particular among IT engineers. According to the latest research in the Republic of Serbia, about 1,500 new qualified IT workers appear on the market every year. If that number increases at least five times, to over 7,000 IT workers a year, the export goals of the Republic of Serbia would be achieved. This situation indisputably indicates the need to invest in the development of both formal and non-formal education.<sup>48</sup> The development of a system that effectively trains 3,500 IT professionals without an academic degree each year implies the efficient use of all resources and cooperation with the economy, while informal training programmes enable those interested to start a career in the IT sector. The software sector, which is largely export-oriented, has 60% higher growth than the overall IT market.

---

<sup>46</sup>[https://www.srbija.gov.rs/view\\_file.php?file\\_id=2312&cache=sr](https://www.srbija.gov.rs/view_file.php?file_id=2312&cache=sr)

<sup>47</sup> Available at: <https://itobuke.rs/>

<sup>48</sup><https://itobuke.rs/dobrodosli-na-sajt-posvecen-prekvalifikacijama-za/>

It generates the highest net profit and requires lower start-up capital compared to other sub-segments in the IT industry. For this reason, non-formal education can have an impact on addressing labour shortages in the software segment of the IT industry. As a key segment in this area, the motivation of training participants has been recognized, as well as the motivation of training organizers to formulate trainings that meet the needs of the market.

Over the course of 2018, significant efforts were made to improve the ICT sector in various fields. The development of digital education, as well as digital competencies of pupils and students in the education system, are conditioned by other reform changes and directions of development in all areas of educational policy. From 1 September 2017, Informatics and Computer Science has become a compulsory subject for fifth grade students in the Republic of Serbia. The concept of the new subject is fundamentally different from what the previous elective course was based on. Students now acquire computer skills through three topics: information and communication technology, digital literacy and computer science. Within the topic of Computer Science, the most important novelty is learning programming in a visual programming language, while starting from the sixth grade, text programming is taught in all primary schools in the Republic of Serbia. The aim of the course is to develop digital literacy, as one of the most important skills for the 21st century.

The new programme recognizes the fact that generations born in the digital age that are enrolling into the education system have a rich experience of using technology on an everyday basis. Informatics and computer science will bring students closer to information technologies and teach them how to use them safely and creatively. On the other hand, programming gives students the opportunity to develop a computational way of thinking and solving problems. Computational thinking is focused on solving problems and is applicable in all areas of human activity. This term includes: decomposition of problems into smaller, easier solvable wholes, recognition of patterns and general solutions, generalization and abstraction, algorithmic manner of solving problems and evaluation of solutions. The number of computer science and informatics classes that include students with special abilities has significantly increased (hereinafter: IT classes) in high schools (4 times more than in the school year 2017/2018). In the 2018/2019 school year, 44 classes were opened in 36 high schools in 29 cities. Training for all teachers is provided in terms of all new IT subjects introduced within these classes. In addition to training courses, appropriate materials have been created that teachers and students can use in their further work. From the 2019/20 school year, the number of IT classes in high schools has increased from 44 to 55 classes. At the request of industry and parents, new profiles have been introduced for high school students in technical schools according to the dual model (technician for digital graphics and internet design and electrical technician of information technologies).

The Plan of priority goals and activities of public administration bodies and government services for the improvement of the IT sector in the Republic of Serbia for 2019, accompanied by the 2018 report, states that citizens also have the opportunity to acquire knowledge and skills for the position of junior programmer within the Government's requalification programme . The

requalification programme includes unemployed people, as well as individuals, who desire to change their existing jobs for better paid ones that offer greater opportunities for advancement. The training programme is designed to quickly contribute to the supply of talent within the labour market. The programme for unemployed is implemented by the National Employment Service, while the Office for Information Technologies and E-Government conducts training for employees, in cooperation with the United Nations Development Program (UNDP). So far, 800 people have been trained through the programme and training courses are under way for 700 unemployed people, while the plan for 2019 included training for 411 individuals in Belgrade, Novi Sad, Niš, Valjevo, Čačak, Subotica, Kragujevac, Novi Pazar, Užice and Zrenjanin. The same document states that, in order to improve teaching at faculties and innovate subjects in accordance with the needs of the digital society, a competition was organized for which 166 teams comprised of professors applied, resulting in 66 receiving funding in the amount of RSD 250,000 to 1,000,000, whereby special value was put on issues such as the extent programmes increased the use of information technology in teaching and learning, their level of alignment with needs of the labour market, the degree to which they developed entrepreneurial skills of students, as well as the level of cooperation of higher education institutions with the economy and other stakeholders in the local community. Particular attention is paid to the construction of innovative infrastructure, under the framework of which funds are allocated for science and technology parks (STP), expanding the capacities of faculties and institutes, equipping modern laboratories that shall be used for education, research and cooperation with the economy. In order to encourage regional development and provide opportunities for talented young people, a competition to support the establishment and development of regional start-up centres in eight cities and municipalities in the Republic of Serbia was successfully conducted, whilst additional support to other cities has also been envisaged. The importance of the development of the ICT sector within the business and market has also been recognized, particularly in view of its size and the number of persons it employs, as well as the impact on the economic indicators of society. As incentives for the development of this sector, in 2018, several significant amendments to the Law on Personal Income Tax<sup>49</sup> and the Law on Corporate Income Tax<sup>50</sup> were adopted, which enabled tax incentives, while from 2019 research and development costs for legal persons in the Republic of Serbia are recognized as an expense for income tax purposes in the amount of twice the actual cost.

Since 2018, in accordance with the digitalization process, a pilot project “Schools for the 21st Century” has been implemented, which includes the provision of microbit devices with which students can quickly and easily master programming. This programme covers all primary schools throughout the Western Balkans and is aimed at students aged 10 to 14. The "Schools for the 21st Century" programme aims to provide support to schools through training courses and

---

<sup>49</sup> “Official Gazette of the RS”, no. 24/01, 80/02, 80/02 - other law, 135/04, 62/06, 65/06 - corr., 31/09, 44/09, 18/10, 50/11, 91/11 - CC, 7/12 - adjusted RSD sums, 93/12, 114/12 - CC, 8/13 - adjusted RSD sums, 47/13, 48/13 - corr., 108/13, 6/14 - adjusted RSD sums, 57/14, 68/14 - other law, 5/15 - adjusted RSD sums, 112/15, 5/16 - adjusted RSD sums, 7/17 - adjusted RSD sums, 113/17, 7/18 - adjusted RSD sums, 95/18 and 4/19 - adjusted RSD sums)

<sup>50</sup> “Official Gazette of the RS”, no. 5/01, 80/02, 80/02 - other law, 43/03, 84/04, 18/10, 101/11, 119/12, 47/13, 108/13, 68/14 - other law, 142/14, 91/15 - Authentic Interpretation, 112/15, 113/17 and 95/18)

assistance to school leaders, provide training and support to teachers, as well as develop students' digital skills and school networking through the availability of resources. In addition, programming has been introduced as a compulsory subject in schools, a pilot project “e-diary” and a pilot project concerning digital textbooks are being implemented, while the number of places for students at technical faculties and the number of IT departments in high schools is increasing.

The National Academy of Public Administration, in accordance with the Law on the National Academy of Public Administration<sup>51</sup>, has formed a programme commission for E-Government and Digitization, which has the objective of systematically analysing the situation within the administration in terms of developing digital competencies of officials, by prioritizing programme content for specialization of civil servants, improving the practice of conducting training courses in this field, as well as by analysing the results of evaluating the implementation of training courses with recommendations for improving training programmes, modernizing the implementation of training (on-line training courses) and other important issues. The modern online learning system developed by the National Academy of Public Administration on its platform will enable greater availability of program content to all employees in public administration by attending online trainings of various content. The modern on-line learning system developed by the National Academy of Public Administration on its own platform shall enable greater availability of programme content to all employees in public administration through attendance at on-line training courses of various content.

### 3.4 Overview of available initiatives and research

As the digital environment changes and evolves rapidly, it is undeniable that it manages to reshape the lives of all of us, in particular the youngest citizens, in many ways, bringing benefits in education, culture and inclusion. Although ICT tools are significant and necessary in children's lives, at the same time their use carries certain risks, including digital violence, exploitation and abuse of children on the Internet.

The results of the survey Children on the Internet - Internet and Digital Technology Use among Children and Youth in Serbia, indicated that the majority of surveyed students from the Republic of Serbia (86%) use the Internet on a daily basis, which almost equates them with children and youth from other countries that participated in this study (Kingdom of Norway, Italian Republic). Two thirds (65%) of the youngest respondents from the sample (9-10 years) and almost all students (98%) from the oldest age group (15-17 years) stated that they access the Internet every day via mobile (smartphone). In terms of time and activities on the Internet, the surveyed students spend on average more than three hours a day on the Internet, but most often they use the Internet for entertainment (watching videos and listening to music), communicating with family and friends and social networks. Almost 40% of students never or almost never use

---

<sup>51</sup>“Official Gazette of the RS”, number 94/17

the Internet for school assignments. However, students from the Republic of Serbia rate their digital skills with a high average grade in the range from 6.7 to 8.6 (on a scale from 1 to 10). Digital skills in this study are divided into five groups and include digital content creation, information skills and information retrieval skills, mobile device use skills, operational skills, as well as social skills, which are rated with the highest grade point average (9.2). The results of this research also indicated the presence of peer violence on the Internet and disturbing experiences, as well as the fact that students frequently do not discuss their problem, but ignore it, closing the application they used or blocking the person who is harassing them. The number of children who often had disturbing experiences is highest in the age group of 13-14 years.

Bearing in mind that the modern digital age is inconceivable without ICT tools, it is necessary to continuously direct children to the correct and safe use of the Internet, in a systematic and comprehensive manner. This includes, first of all, educational campaigns and workshops for children, but also formal channels of education, so that the topic of children's safety on the Internet is included in the content of the primary education curriculum. In this manner, greater inclusion of teachers and parents is achieved in this area, thus strengthening their knowledge and digital skills in the field of information security in general, as well as the safety of children on the Internet.

With the aim of encouraging and promoting the smart and safe use of digital technologies, since 2016, the Ministry of Trade, Tourism and Telecommunications has been conducting an educational campaign "IT Caravan" intended for primary school students, their parents and teachers. This programme, which consists of educating about child safety on the Internet (plays, interactive conversations with children, competition quiz, etc.) and workshops for students and parents, was presented at the end of 2018, in a total of 104 schools, with the participation of 10,900 children and 3,700 parents. Over the course of 2019, the implementation of these educational activities continued, hence 2,000 students from 25 schools in five cities within the Republic of Serbia (Belgrade, Zrenjanin, Niš, Novi Pazar, Čačak) participated in IT Caravan 04. In 2017, the National Contact Centre for Child Safety on the Internet was established within the line ministry (hereinafter: Contact Centre) with the task of continuously counselling children, parents, students and teachers on the benefits and risks of using the Internet and safe ways to use the Internet. Activities of this centre have influenced an increase of digital literacy, as well as an improvement of children's safety on the Internet. The Contact Centre enables the reception of reports concerning harmful, inappropriate and illegal content and behaviour on the Internet (e.g. peer digital violence, child pornography, sexual exploitation, and so-forth), which are further processed and forwarded to competent institutions, within the framework of established interdepartmental cooperation. The number of applications filed with the Contact Centre is continuously growing (6,500 inquiries/ applications as of 2018), which confirms that this topic is recognized by citizens as extremely vital for their daily lives and the lives of their children. These activities follow the Council of Europe Strategy on the Rights of the Child (2016-2021), in the part related to the rights of the child in the digital environment, which envisages that the outcome of measures and activities includes empowering children to fully exploit the potential of ICT and education on digital citizenship.

The significance of such on-line support services for children and parents was highlighted in a comparative analysis of international experience and good practice on child safety on the Internet and ways of using the digital world, which showed that such services exist and operate effectively in various European countries. An example of one such service in Europe is Jugend Support<sup>52</sup>, which was established by the German Federal Ministry in charge of family issues, senior citizens, women and youth in cooperation with the German Safer Internet Centre - Better Internet for Kids. Similar support services exist and operate effectively in other European countries, such as the Kingdom of Spain and Hungary.

In the process of realizing perspective practice for confirmation and encouragement of children's rights in the digital environment, the execution of programmes in the field of information society development intended for young people has a particularly paramount role. Through competitions intended for non-governmental non-profit organizations, support has been provided for dozens of projects so far, some of which were also in correlation with international competitions in the mentioned areas where students achieved outstanding results. Over the course of 2018, a public call was announced for the allocation of funds for programmes in the field of information society development on the topic "International competitions", while in 2019 a public call was announced on the topic "International competitions in the fields of computer science, informatics, mathematics and physics".

On the topic of protection of children in the digital environment, the Ministry of Education, Science and Technological Development is implementing the project "Stop Digital Violence"<sup>53</sup> and the project "Capacity Development of the System for Combating Violence, Misuse and Abuse of Children via the Internet"<sup>54</sup>. Furthermore, since 2017, a project aimed at introducing digital educational materials in 2,000 "digital classrooms" has been under way with the participation of selected first and fifth grade primary school teachers. With the help of these materials, the learning process is more efficient and interesting, while students are better acquainted with the advantages of new technologies.-

As regards digital infrastructure, the Ministry of Trade, Tourism and Telecommunications has successfully completed the first phase of the "Connected Schools" project, through which most of the approximately 1,700 home schools in the Republic of Serbia received free, fast, reliable and secure access to the Internet and to national and European academic networks and facilities and services they offer. The second phase of the "Connected Schools" project, which shall be realized in the period 2019-2021, envisages comprehensive improvement of information and communication infrastructure in all primary and secondary schools in the Republic of Serbia. The expected results of this project related to connecting and networking schools are in line with Recommendation CM/REC (2018) 7 of the Committee of Ministers to Member States on

---

<sup>52</sup> <https://www.jugend.support/>

<sup>53</sup> in partnership with UNICEF and Telenor company

<sup>54</sup> In cooperation with the Pedagogic Society of Serbia and UNICEF

guidelines to respect, protect and fulfil the rights of the child in the digital environment<sup>55</sup>. Section 3.1 of this Recommendation “Access to the Digital Environment” stipulates that members should take measures to ensure that access to the digital environment is free of charge in designated public places, as well as to ensure that access to the digital environment is provided for children in the educational environment under which they are educated and that they are given protection.

The topic of greater involvement of women in the field of information and communication technologies and the benefits it could provide to overall social development was addressed by the European Institute for Gender Equality in its research *Women and Men in the Field of ICT: Challenges of balancing between work and family responsibilities*<sup>56</sup>. This research points out that experts in information and communication technologies are especially in demand, and that employment growth in this area is more than eight times higher than the average employment growth in the European Union. What is worrying, however, is that of the nearly eight million professionals in the field, only about 17% are women, and that the number of women graduating from ICT studies has been declining over the last decade. It is estimated that attracting more women to the science, technology, engineering and mathematics sectors would lead to economic growth with more jobs - up to 1.2 million by 2050 and an increase in gross domestic product in the long run - to EUR 820 billion by 2050. In addition, increasing the number of women in these jobs would contribute to reducing the gender pay gap, given that this is the area with the highest salaries (women in this profession are paid more than in others). The gender pay gap of 13% among ICT professionals is smaller than in other professions where it is 26% among health professionals and 33% among other employees<sup>57</sup>. One of the reasons for the serious under-representation of women in these jobs is gender segregation in the field of education, as well as an unbalance between work and family obligations. This is supported by data showing that until 2016, only in four countries of the European Union, from 1% to 3% of teenage girls aspired to become professionals in this field.

As regards to women's empowerment in the ICT sector, the Ministry of Trade, Tourism and Telecommunications supports information society development programmes related to the economic empowerment of women in the ICT sector, which aim to reduce the digital divide in the use of ICT tools between women and men, and in connection with that, achieving gender equality in this area. Over the course of 2017, under the topic of “Requalification and additional training of women in the field of ICT”, nine programmes were (co) financed by associations, while training courses on programming, programming languages and tools were attended by 256 women. Unemployed women between the ages of 20 and 40, with a university degree, showed the greatest interest in these training courses. During 2017, that ministry also ensured the implementation of the project “Training for women in the field of IT”, which is supported by UNESCO. The project was implemented through the organization of seminars and courses in the field of IT for 200 unemployed women in the area of basic skills and 20 unemployed women who

---

<sup>55</sup>from July 2018

<sup>56</sup>*Women and men in ICT: a chance for better work-life balance - Research note*, European Institute for Gender Equality, available at: <https://eige.europa.eu/rdc/eige-publications/women-and-men-ict-chance-better-work-life-balance-research-note>

<sup>57</sup>Ibid., pg. 45

attended an advanced course. Over the course of 2018, on the topic of raising the level of digital literacy and digital competencies of women from rural areas, eight programmes implemented by associations were financially supported, including workshops, training courses and computer literacy classes for over 350 women from rural areas throughout the Republic of Serbia, with the aim of improving their digital literacy and skills, including through digital promotion of traditional local products.

In order to raise awareness and affirm digital skills in education and reduce the gap in the use of ICT tools between boys and girls, International Girls in ICT Day is celebrated every year under the organization of the Ministry of Trade, Tourism and Telecommunications, with the participation of institutions, sectors, universities, establishments and companies in the field of digital technologies, as well as girls of primary school age. The need for empowerment of women and girls in the ICT sector was also recognized by the Government, which, at the suggestion of the relevant ministry, adopted the National Programme for Women's Empowerment in the field of information and communication technology (ICT) for the period 2019-2020<sup>58</sup>, which is the first public policy programme in this area with a set of programme measures and activities aimed at affirming the digital skills and competencies of the female population of all ages, starting with girls of primary school age, then high school students, (unemployed) women, including members of the older generations.

Progress in automation and digitalization is rapidly changing the structure of local economies, whereby the economy in the Republic of Serbia is no exception, concerning which a detailed overview is given through the *The Future of Work in Serbia* programme<sup>59</sup>. Inclusion of digital technologies in everyday life and in the field of work, transition from labour-intensive to technology-intensive sectors, as well as increasing the number of workers from the Republic of Serbia in the so-called gig economy, have led to a number of different challenges, which are reflected in the segmentation and atomization of the labour market, widening of the digital divide and creation of new forms of inequality, lack of legal solutions in this area, hence eroding of social security programmes in conditions of slow economic growth and low productivity. Furthermore, new types of jobs and new, mostly flexible, forms of employment affect the nature and business conditions of companies, the demand for skills and knowledge different from traditional ones, the nature of work and change of the income structure of individuals, families and communities. Another set of skills in the advanced category is digital entrepreneurship, which is a combination of traditional entrepreneurship and new digital technologies. The scope of such work in the Republic of Serbia is indicated through a review of research on gig economies in the Republic of Serbia: Who are digital workers from the Republic of Serbia and why do they work on global platforms? Digital companies are characterized by high intensity in terms of new digital technologies usage (in particular social media, large data analytics, mobile and cloud

---

<sup>58</sup>“Official Gazette of the RS”, number 18/19

<sup>59</sup>Centre for Public Policy Research through *The Future of Work in Serbia* programme, Research on Gig Economies in Serbia: *who are digital workers from Serbia and why do they work on global platforms?*, available at: <http://publicpolicy.rs/documents/9636006fc4fd4ae4322b8d7434d21a3233237fae.pdf>

solutions) in order to improve business activities, create new business models, strengthen business intelligence and connect with customers and stakeholders.

The Republic of Serbia has been at the very top of the world in terms of the number of workers on global on-line platforms for years. This fact was first pointed out by the World Bank in its report for 2015. The Republic of Serbia, together with Romania, is ranked among the leading countries in the world and in Europe in terms of the percentage of on-line labour force in relation to the total population, and in relation to the total labour force in the country. Such characteristics make the Republic of Serbia a very interesting member of the global community of digital workers, and at the same time impose the need to study this phenomenon within the national economy, with a focus on the labour market and hidden employment. Digital work is one of the first and most massive phenomena that connects the fields of digitalization and work and employment. Digital “mass” work represents paid distance working where the employer is not necessarily located, nor is it registered in the same country as the worker. According to the analysis of the labour market in the on-line sphere, the supply of digital labour is more present in developing countries with developed IT industries. Digital workers most often provide services in the areas of software and technology development (IT sector), writing and translation, creative and multimedia industries, sales and marketing, office and data entry services, and professional services such as legal, financial, consulting, and so-forth. On the other hand, digital work and platforms in principle allow workers to overcome the shortcomings of a local market within which there is no demand for their skills and/ or which offers lower prices for their work. They provide workers, even without work experience, with the opportunity to find a job. This has proved particularly important for workers in rural areas where employment opportunities are reduced or workers face high barriers for entry due to their age, health circumstances, discrimination (for example in the case of migrants, women, sexual and national minorities) or in circumstances when they are in need of a workload that allows them to perform other tasks such as caring for the elderly and/ or children. Digital work has, in various local contexts, been presented as an economic development opportunity and a remedy for unemployment, but its impact on the achievements of decent work and the quality of employment has not been sufficiently explored. Young and highly educated people with university degrees in economics, design, marketing, architecture, philology and engineering are the most numerous among digital workers from the Republic of Serbia. They most frequently register their own business entity and provide services in the field of software and technology development (30%), writing and translation (29%) or work in the creative and multimedia industry (22%).

Simultaneously, the improvement of skills in digital work depends on the worker himself, who is responsible for both his/her personal and business development. As the findings of this research show, digital work requires continuous learning that is encouraged by the nature of work in the on-line sphere. This learning also implies retraining, primarily through non-formal education. Digital workers themselves are exploring market demand and ways to respond to it. Improving skills in digital work refers to both professional and technical skills, as well as “soft skills”. They are crucial for success in this type of work and include active communication, creativity, problem solving, the ability to negotiate and adaptability. Equally vital is knowledge

of business cultures in different contexts, which affects the better placement of services that digital workers can offer.

The results of a survey on digital skills in the labour market, conducted under the USAID “Economic Development Cooperation” project, indicated that developments in the Fourth Industrial Revolution require the workforce, regardless of occupation, to adapt and build their skills to keep pace with progress in digitization. Opinions are divided that the development of digital technologies shall lead to a greater demand for highly skilled workers who possess cognitive skills and technical knowledge, and on the other hand, that future demand will be oriented towards skills related to art and creativity.

Within the mentioned research, a quantitative research of the expressed needs for digital skills in job advertisements was conducted. The survey included 107,000 job advertisements in the previous six years<sup>60</sup>. Digital skills needs are defined in five levels, as follows: 0 - the advertisement has no explicit mention of digital skills, 1 - basic computer skills and use of the Internet, 2 - work in MS Office and similar packages and content creation, 3 - use of specialized software for data analysis, design, resource management (ERP), bookkeeping, and so-forth, and level 4 - software development and IT qualifications. The analysis of the results, among other things, showed that the number of advertisements has been constantly and rapidly growing over the last six years, while the number of applications is not following that growth, which indicates an increased supply of jobs in relation to demand (which can be observed also from the increased average time of an ad’s duration), but also the possible increased turnover of workers. Jobs with all levels of required digital skills are on the rise, which can be seen both from the absolute quantities of advertisements and from the percentage of ad appearances by levels of digital skills. There has been a large increase in jobs without required digital skills (level-0), in particular since the end of 2016, which indicated an increase in the inflow of ads for jobs with low qualifications (education, levels of complexity, etc.). This also shows the increased use of digital advertising platforms even for jobs with low required qualifications, which implies certain digital skills for job searching via the Internet. Finally, there are a number of jobs that do not require digital skills when those skills are implied.

In view of jobs with basic and secondary digital skills (levels 1, 2 and 3), it was found that there is a constant increase in all levels of job complexity and levels of education. Although weaker than other levels, the demand for the highest form of digital skills (level 4) has increased sharply (since 2013 that demand has tripled).

The results of this research indicated that the level of digital skills required is largely related to the level of education required for a job, so higher levels of digital skills are more frequently required for higher levels of education. Jobs with a higher level of required digital skills more often imply knowledge of foreign languages, so these two skills are certainly correlated on the labour market. A higher level of job complexity also more often implies higher levels of digital skills. For the highest level of job complexity (level 3 - managerial and expert positions), a significant increase in the requirement for digital skill level 3 was observed, which

---

<sup>60</sup> The research was conducted on job advertisements on the Infostud portal published in the previous six years.

refers to the use of specialized software for resource management and workplace engagement. Finally, differences between industries have been observed, for example “transport” or “catering” do not have a developed demand for digital skills, while branches such as “accounting, bookkeeping”, “law” and “trade, sales” have a significantly higher demand for such jobs.

Within this research, consultative processes were conducted through participation in a focus group with a wide range of stakeholders in the field of digital skills development. The aim of the meeting was to discuss strategic activities proposed by the Digital Skills Development Strategy. Participants in the consultations covered all four target groups covered by the Strategy: education, citizens, employees/ labour market and ICT professionals. It was concluded that the adoption of a strategic document in this area is extremely vital, as it contributes to the fact that a large number of individual initiatives and activities that currently exist act synchronized and complementary, and that private sector participation for development in this area is also very important.

Within this research, an analysis was conducted that refers to the demand for digital skills of consumers in e-commerce. The aim was to determine which digital consumer skills are significant for the development of the e-commerce sector in the Republic of Serbia. The case study technique was used through structured interviews with companies that have developed e-business, and the interview questionnaires are based on the EU framework for digital consumer skills. Consumers stand out with having three skills: viewing, searching and filtering information; evaluation and comparison of information; and sharing information with other consumers. The biggest gap among consumers is in the following skills payment and financial management; personal data and privacy management; and determining consumer rights in the digital marketplace. The conclusion states that the current level of digital skills of consumers is at a moderate level. As the e-commerce market is characterized by a high annual growth rate, future measures and activities aimed at developing this market segment, in terms of raising the capacity of knowledge and skills of consumers, should be focused on the following areas: management of payments and finances through digital means; personal data and privacy management (in addition to digital identity management); and determining consumer rights in the digital market (before and after purchase), which shall also contribute to overcoming mistrust or fear, which is the main barrier for consumers.

Considering all the above relevant data, it can be concluded that undeniably that big steps forward are visible, both in the use of information technology and in terms of the level of knowledge and capacity of the society. However, the steps taken so far in certain areas need to be synchronized and coordinated. It is necessary to systematically approach the improvement of digital skills of the entire population in order to best respond to the challenges of modern, rapid technological development. The presented data indicates that it is necessary to pay special attention to certain categories of the population, such as young people, the elderly population and the population from rural areas, as well as to achieving gender equality in this area, which is especially crucial given the existing demographic structure.

The needs of the modern labour market require that employees have certain specific knowledge and skills, in order to be able to perform work tasks efficiently, while on the other hand, employers can only be competitive with a trained workforce. This situation on the labour market causes the need for constant training of both employees, whose knowledge should be accompanied by technological and technical development, and the unemployed, who need to find their place in the labour market. Special attention is required in terms of regular monitoring of progress in the field of ICT by experts, as well as further development of this field, which, according to the presented data, is recording a noticeable growth.

These facts have been recognized by the Government, which is why there are plans to adopt a strategic document in the field of digital skills development in the Republic of Serbia, which would comprehensively regulate the development of digital skills of the population in order to use the potential of modern information and communication technologies in view of improving the life of all citizens and achieving higher employment, work efficiency and economic growth of the society as a whole.

## 4. OBJECTIVES OF THE STRATEGY

The Strategy for the Development of Digital Skills in the Republic of Serbia for the period 2020-2024 (hereinafter: Strategy) in a unique and comprehensive way determines the directions of action in the field of digital skills improvement in the Republic of Serbia, having in mind what has been achieved so far and the desired directions of capacity development of the entire society for usage of modern information and communication technologies, information society development and digital economy in the Republic Serbia.

The Strategy builds on the New Skills Agenda for Europe and the European Sustainable Growth Action Plan<sup>61</sup>, bearing in mind that these documents specify the objectives of the Europe 2020 Strategy and that they represent the basis for directing strategic and reform processes and development priorities for European Union candidate countries, including the Republic of Serbia. Challenges in the field of education and training, development of digital skills for all citizens, development of digital skills in relation to the needs of the labour market, as well as monitoring the further development of this field by ICT experts, were identified as the main challenges of the perceived lack of digital skills. Digital skills have their place in the broader framework commonly referred to as *21st Century Skills*<sup>62</sup>, which according to the World Economic Forum consist of three pillars: fundamental skills, competencies and character qualities. Fundamental skills are understood as ICT literacy, with an emphasis on the importance of the link between the possession of digital skills, competencies and quality, all within the general need for lifelong learning. In order to support the Agenda for Sustainable Development until 2030, a global initiative for increasing activities and impact on youth employment “Decent Jobs for Youth”<sup>63</sup> was initiated, as a global initiative to increase activities and impact on youth employment, aiming to achieve higher employment of young people, provide decent jobs for young people and facilitate easier transition from school to work, with a special place envisaged for the constant development of skills needed in the labour market.

Having in mind the considered international framework for the development of digital skills, the current situation in the Republic of Serbia, the commitment to accession to the European Union and the commitments made under the Stabilization and Association Agreement, this strategy recognizes the same areas (defined as specific objectives) that have also been recognized in appropriate documents of the European Union, whereby certain measures and activities have been adjusted both to the current situation in the Republic of Serbia and to the possibilities for their improvement.

---

<sup>61</sup>COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, Next steps for a sustainable European future European action for sustainability, available at: [https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122\\_en.pdf](https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122_en.pdf)

<sup>62</sup>according to a report of the World Economic Forum

<sup>63</sup>Decent Jobs for Youth, available at: <https://www.decentjobsforyouth.org/about>

#### 4.1. General objective of the Strategy

The general objective of the Strategy is to improve the digital knowledge and skills of all citizens, including members of vulnerable social groups, in order to enable monitoring over the development of information and communication technologies in all areas and meet the needs of the economy and labour market.

Indicator at the level of general goal: Number of citizens with advanced digital skills

Base value in 2018: 34.2% of computer literate persons, 14.8% of computer partially literate persons

Target value in 2024: 46.2% of computer literate persons, 26.8% of computer partially literate persons

Verification source: Annual reports of the Statistical Office of the Republic of Serbia

#### 4.2. Specific objectives of the Strategy

The specific goals of the Strategy include providing an efficient response to technological changes and thus enabling the development of individuals and the society in circumstances of rapid modern technology development in all segments of life, as well as providing an adequate response to the growing needs of the labour market. The specific objectives of the Strategy are as follows:

**- *Improving digital competencies in the education system*** - Knowledge of basic digital competencies, programming and computer problem solving has become an integral part of the curriculum in schools at all levels of education and it is necessary to continuously improve it

Indicator at specific objective level: The number of schools that implement digital competencies learning and the number of students that possess digital competencies

Base value in 2018: 55 gymnasiums with IT departments

Target value in 2024: number of gymnasiums with IT departments increased by 20%

Verification source: Reports of the Ministry of Education, Science and Technological Development

**- *Improving basic and advanced digital skills for all citizens*** - Providing basic digital skills knowledge should cover as many citizens as possible through various training courses, through expanding the number of stakeholders, in particular among the elderly, as well as in areas where there are fewer users of information and communication technologies, such as rural areas and smaller urban areas, enabling participants to acquire digital skills to keep pace with technological advances

Indicator at specific objective level: Percentage of computer illiterate people

Base value in 2018: 51% of computer illiterate people

Target value in 2024: 27% of computer illiterate people

Verification source: Annual reports of the Statistical Office of the Republic of Serbia

- ***Development of digital skills in relation to the needs of the labour market*** - This objective includes training programmes for workplace engagement and training for the unemployed within the implementation of active employment policy measures, taking into account the number of women involved and the effects of measures taken. Possessing digital skills related to the effective use of technology in addition to entrepreneurial/ business skills can be the basis for starting a new business and achieving success in the digital economy, which can be jointly carried out in particular in relation to young people.

Indicator at specific objective level: Number of persons involved in digital skills training

Base value in 2018: 1000 persons who have passed specialist IT training courses

Target value in 2024: 1200 people who have completed specialist IT training courses

Verification source: Report on the work of the National Employment Service

- ***Lifelong learning of ICT professionals*** - This objective includes programmes for monitoring development and progress in the field of ICT professionals in higher education institutions and implies the exchange of knowledge and experiences within companies and associations of experts, and so-forth. In this manner, ICT experts would have ready skills to follow rapid technological progress, while the further development of information technologies would be enabled.

Indicator at specific objective level: Number of enrolled ICT students

Base value in 2018: 20,908 enrolled male students and 5,725 female students

Target value (in 2024): an annual growth of 5% of enrolled male students and 10% of enrolled female students

Verification source: Statistical Office of the Republic of Serbia

The link between special objectives conditions the connection and jointly coordinated approach of all stakeholders responsible for the implementation of certain measures and activities, as well as constant monitoring of achieved results in order to timely respond to any need for making possible changes, in accordance with technological progress, achieved results and the needs of the society. The realization of special goals directly affects the realization of the general objective of the Strategy.

## 5. MEASURES TO ACHIEVE THE OBJECTIVES OF THE STRATEGY

The measures defined by this strategy are determined in accordance with the general and specific objectives of the Strategy, they are complementary and should be interpreted as a whole.

### **Specific objective 1. Improving digital competencies in the education system**

Numerous studies indicate the importance of introducing digital skills in school-level teaching, in view of the fact that the number of people completing various training courses is far below the required number of trained people who possess digital skills in a modern society. The basis for the future development of each country are new and specialized skills, therefore programmes for acquiring digital skills should move in that direction. Therefore, in order to balance the development of secondary and advanced vocational skills with personal and social needs, these skills should be part of school curricula and should in various scopes include educational institutions at all levels - from primary to higher education.

In order to achieve the inclusion of different digital competencies in the educational process, it is first imperative to define the necessary areas of competencies, levels of expertise, knowledge, skills and attitudes related to each of these competencies individually, in relation to educational levels and types of educational institutions providing those competencies. Areas of digital competencies include:

- Information and data literacy (browsing, searching and filtering data, information and digital content; evaluation of data, information and digital content; data, information and digital content management);

- Communication and collaboration: interaction through digital technologies (exchange through digital technologies; participation in civic duties through digital technologies; collaboration through digital technologies; internet etiquette; digital identity management);

- Creation of digital content (creation of digital content; integration and detailed editing (elaboration) of digital content; copyrights and licenses; programming);

- Security (protection of devices; protection of personal data and privacy; protection of health and well-being; protection of the environment);

- Solving problems (solving technical problems; identifying needs and technological responses; creative use of digital technologies; identifying shortcomings in digital competence).<sup>64</sup>

The European Commission's Digital Competence Framework for Citizens or DigComp, which is a tool for improving citizens' digital competences and defines a common language on

---

<sup>64</sup> Development of digital skills and competencies: Quick overview of the state of 13 digital literacy models, available at: [https://www.nb.rs/view\\_file.php?file\\_id=5610](https://www.nb.rs/view_file.php?file_id=5610)

how to identify and describe key areas of digital competence, can also serve to achieve this specific goal, thus creating a common reference at the level of the whole of Europe.

The realization of this goal implies inter-sectoral cooperation and assessment of the current state of digital skills in education within the Republic of Serbia, as well as consideration of the European framework and the necessary competencies and learning outcomes in the Republic of Serbia, depending on the level of expertise. The basis for the improvement of digital competencies in the education system is a document that determines the areas of competencies and learning outcomes, levels of expertise, knowledge, skills and attitudes related to each of the digital competencies individually in relation to education levels and types of educational institutions. In the Republic of Serbia, this document is the “Digital Competences Framework - Teacher for a Digital Age 2019”, which through indirect application contributes to the development of students' digital competencies for living and working in a digital society.<sup>65</sup>

Measures to achieve specific objective 1 are implemented with the aim of raising digital skills through the education system and they include the following:

1.1 Providing conditions for learning and acquiring digital competencies within the education system;

1.2 Improving plans and curricula for teaching and learning in order to acquire digital competencies over the course of pre-university education.

### *1.1 Providing conditions for learning and acquiring digital competencies within the education system*

Measure type: Provision of goods and provision of services by participants in the planning system

Institutions responsible for the implementation of the measure: The Ministry of Trade, Tourism and Telecommunications and the Ministry of Education, Science and Technological Development

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of schools in which digital infrastructure is provided

Verification source: Reports of the Ministry of Trade, Tourism and Telecommunications and Reports of the Ministry of Education, Science and Technological Development

Providing adequate ICT infrastructure implies equipping schools with computers and, along with improving teachers' competencies, represents a precondition for including learning

---

<sup>65</sup> Digital Competences Framework - Teacher for a Digital Age 2019 is available on the website of the Ministry of Education, Science and Technological Development, link: [http://www.mpn.gov.rs/wp-content/uploads/2019/08/2019\\_ODK\\_Nastavnik-za-digitalno-doba.pdf](http://www.mpn.gov.rs/wp-content/uploads/2019/08/2019_ODK_Nastavnik-za-digitalno-doba.pdf)

basic digital competencies, programming and computer thinking in the education system, i.e. in the basis of the ICT education programme. Schools and teachers play a key role in learning and developing digital competencies, not only by enabling early exposure to computers, software and the Internet, but also by developing thinking that stimulates curiosity and adaptability in students. Furthermore, the education system has the potential to make extensive changes at the national level, given the territory it covers and the number of young people it reaches.

With the development of modern digital technologies, new opportunities have opened up for the improvement of the educational process, which enable students to master material faster and with better quality and advance their knowledge to be significantly more applicable in future life and work. In that sense, digital teaching contents are being created that imply a different learning process in relation to the traditional one, which is a necessary precondition for ensuring competitiveness of the economy. In the previous period, a pilot project was implemented in which 10,000 digital classrooms were equipped with accompanying digital teaching content, while in the following period there are plans to continue this project, which includes equipping classrooms with digital equipment and materials and training teachers to use equipment and materials during classes<sup>66</sup>. The improvement of communication infrastructure is under way, which shall be completed by the end of 2021 in all domestic school facilities in the Republic of Serbia and provide secure and reliable wireless internet access in all teaching and administrative school premises. In this sense, this project covers two key segments of information and communication infrastructure within the area of education, as follows: improving central communication infrastructure and building local wireless communication infrastructure (WLAN) in schools.<sup>67</sup>

The challenge that may arise in the implementation of this measure is the timely provision of a sufficient amount of funds for adequate infrastructure in schools throughout the Republic of Serbia, which requires precise planning of funds, multi-sectorally coordinated by responsible institutions and the Government itself. Moreover, it is necessary to plan and provide donor funds within the framework of the implementation of appropriate projects.

In the previous period, training courses for the realization of informatics in first grade IT classrooms were successfully conducted and digital teaching materials were developed that support teaching in first and second grade IT classrooms. In order to enable the realization of this specific goal, it is necessary to develop digital teaching materials for all types of educational institutions and at all levels. The implementation of the “Schools for the 21st Century” programme<sup>68</sup> includes training of teachers for the implementation of classes that encourage the development of critical thinking among students, problem solving and the development of digital literacy. Each of the schools included in this programme received 30 micro:bit devices (programmable digital devices suitable for project teaching, improving the functionalization of students' knowledge and creating significant changes in the dynamics of the teaching process)

---

<sup>66</sup> 20,000 classrooms until 01/09/2020 and 30,000 classrooms until 01/09/2021

<sup>67</sup> Plan of priority goals and activities of public administration bodies and government services for the improvement of the IT sector in Serbia for 2019, accompanied by a 2018 report

<sup>68</sup> The programme is implemented in the Republic of Serbia in partnership by the British Council and the Ministry of Education, Science and Technological Development

and training related to their programming. In the initial phase, 25 schools distributed within the territory of the Republic of Serbia are included in this project, while the plan is to expand it to all primary schools in the region. The implementation of the programme lasts three years, which means that all primary schools in the Western Balkans shall receive training and micro:bit devices by the end of 2021. Considering that the Republic of Serbia has a defined agenda regarding the introduction of informatics as a compulsory subject in higher grades of primary school, the programme “Schools for the 21st century” is adjusted to the specific conditions in our country. Namely, 36,000 devices shall be deployed to schools within the framework of this project, in accordance with the number of students. The plan is to form an on-line network of primary schools after the completion of all training courses, which would provide for the exchange of examples of good practice and solve possible doubts and problems through mutual cooperation. Regional competitions for students based on teamwork and solving problems from real life have also been envisaged. Within the “Schools for the 21st century” programme, training for primary school principals has also planned.<sup>69</sup>

In order to achieve the appropriate standard of digital skills among students, it is necessary to empower all teachers and in particular computer science teachers through the creation of appropriate professional development programmes and increase of teaching staff competencies. In that sense, it is necessary to create appropriate professional development programmes and appropriate materials for teachers so that they can be capable of transferring knowledge. Training courses can be conducted as standard or on-line training.

The programme for the development of digital competencies of teachers implies that the development of critical thinking is encouraged in teaching and students are stimulated to independently research, discover, solve problems and make decisions, as stated in the Plan of priority goals and activities of public administration bodies and government services for the improvement of the IT sector in Serbia for 2019, accompanied by a 2018 report, which is why the use of modern technologies is needed in order to develop learning related to practical problems, real conditions and teamwork.

Teachers are expected to possess the appropriate level of digital competencies, which implies additional teacher education, which should be based on a reference framework for professional growth and development throughout one’s career. Digital Competences Framework - Teacher for a Digital Age 2019 describes digital competencies for the teaching profession, thus providing a guide to teachers in the use of technology and encouraging creative thinking about how to use technology for learning and teaching. With the adoption of the Digital Competences Framework for teachers, the conditions for systematic training of teachers in the field of digital literacy have been met. The framework needs to be continuously reviewed and revised in line with new developments in the field of educational technology, and it is necessary to continuously monitor the need for appropriate competencies of teachers at different levels of education in relation to rapid technological change. This programme should include the promotion of peer to

---

<sup>69</sup> Plan of priority goals and activities of public administration bodies and government services for the improvement of the IT sector in Serbia for 2019, accompanied by a 2018 report

peer education<sup>70</sup> and the exchange of good practices between teachers regarding digital skills, with special emphasis on innovation in the pedagogical process, through the organization of events, publishing professional publications and developing on-line portals.

The challenges that may arise in the implementation of this measure relate to the coverage of a sufficient number of adequately trained teachers and their motivation to achieve the intended results. This challenge may be overcome by additionally motivating teachers and rewarding both teachers and schools that achieve the best results.

The measure includes the following activities:

1.1.1 Improving central communication infrastructure and building local wireless communication infrastructure (WLAN) within educational institutions, including preschools and cultural institutions;

1.1.2 Provision of digital equipment and teaching material in educational institutions;

1.1.3 Analysis of available training courses for acquiring digital competencies for teachers, educators and professional associates;

1.1.4 Mentoring work with teachers and young talents in the fields of mathematics, physics, technical sciences and informatics.

*1.2 Improving plans and curricula for teaching and learning in order to acquire digital competencies over the course of pre-university education.*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: The Ministry of Trade, Tourism and Telecommunications and the Ministry of Education, Science and Technological Development

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of students involved in educational activities in the field of digital skills

Verification source: Reports of the Ministry of Trade, Tourism and Telecommunications and Reports of the Ministry of Education, Science and Technological Development

The formal education sector is slower when curriculum changes need to be adopted, which is a situation that has a markedly negative impact on digital skills education, given the speed of technological progress and ever-changing employment needs. This stresses the need to set deadlines for the development of curricula by level of education, while, on the other hand, it is necessary to consider the possibility of adopting flexible curricula that would be able to provide answers to the rapid development of ICT in the future.

---

<sup>70</sup> Education model in which members of the same community or profession share knowledge with each other (P2P)

Topics studied in schools are computational thinking, data literacy and mobile literacy. Lectures on computational thinking can start while the children are still in primary school, and in practice, in some schools, such classes have started through certain projects. Thus, computational thinking starts from the basic level and proceeds to advanced topics. In parallel with these topics, it is necessary from the earliest period to include topics related to security when using ICT, in terms of protection of personal data and privacy, as well as protection of health and well-being of all users. In this regard, in the modern digital age, digital competencies can be studied within different subjects, e.g. critical thinking and checking sources of information within the Serbian language and literature, security, human rights and data protection within the society, civic education or citizens' rights, internet addiction and health challenges within the field of biology, and so-forth.

Lectures on computational thinking can be introduced through exercises that do not require any technology, with the gradual introduction of computers and other devices. In order to achieve the realization of the specific objective related to the inclusion of digital skills in educational institutions, it is necessary to make a detailed plan as soon as possible regarding how digital competencies knowledge would be introduced in all schools in the Republic of Serbia, taking into account technical capacities and possibilities, the dynamics of implementing training courses for teachers, as well as capacities in terms of appropriate financial resources.

The results achieved so far include an increase in the number of IT classes in some high schools throughout the Republic of Serbia, and it is to be expected that this number of classes shall be further increased. The success of implementing the curriculum in classes of students with special abilities for informatics implies highly competent teaching staff, capable of creating a dynamic and adaptive educational environment and providing the best environment for developing students' information technologies-related knowledge.

On the other hand, it is possible to introduce other topics into the education system, such as data processing skills, which include: recognizing data needed for specific purposes, interpreting and visualizing data such as graphs and diagrams, critical thinking in relation to information obtained from data analysis, understanding analytical tools and methods for processing data and when and where to use the aforementioned, and recognizing when data is misinterpreted or used to deceive. People who can extract meaningful information from data are in high demand in all sectors and this is a trend driven by the global explosion of big data and the proliferation of sophisticated tools for managing, analysing and visualizing data. Some research indicates that in ten years, data experts shall become more in demand than computer experts.

When defining plans and programmes for teaching and learning digital competencies, it is necessary, through interdepartmental cooperation, to consider the possibilities of using alternative teaching methods such as existing on-line education campaigns, visits to science and technology parks, institutes and universities, using examples of good practice and so-forth. Defining the curriculum of teaching and learning implies considering different possibilities and practices in terms of access to teaching and possibilities of implementing different curricula depending on the level of expertise. In addition to topics related to computational thinking (which may include expanding the scope of digital competencies in existing curricula such as algorithmic and critical

thinking, digital security and media literacy), data literacy and mobile literacy, it is also possible to use existing on-line education campaigns in the educational process. Examples of such campaigns that are already being implemented around the world are as follows: 1) Hour of Code is a global campaign that encourages educators around the world to hold one hour of programming lectures during National Computer Science Education Week. Lectures/ instructions are offered in 45 languages and aim to make students understand that computer science is fun and creative and accessible to people of all ages and all students; 2) UNESCO YouthMobile is an initiative aimed at strengthening global efforts to introduce young people to “programming in the fields of computer science (learning-to-code) and problem solving (coding-to-learn)”, with special focus on women. In the Republic of Serbia, such campaigns are conducted by the relevant ministry of telecommunications and information society (for example, the IT Caravan campaign), which aims to promote smart and safe use of the Internet and improve children's digital skills. The purpose of such campaigns and initiatives is to provide young people with a high level of skills and self-confidence, as well as to properly present them the advantages and dangers of using information and communication technologies in the modern digital age.

On the other hand, cooperation with science and technology parks and visits to universities and institutes can be inspiring for students, who might opt for these occupations. This is especially significant in terms of including of a larger number of girls in technical educational profiles, which, as numerous studies show, gives outstanding results. That is why it is crucial to make a public list of destinations that students can visit during organized excursions. Such visits and providing examples by pointing out specific jobs and successful results provoke positive reactions from students because they have a unique opportunity to learn more about how engineers work, namely, how they turn their ideas into specific products. In addition to such activities, it is possible to organize competitions among students with appropriate prizes.

After creating the curricula for classes and learning digital competencies, it is necessary to prepare an implementation plan for educational institutions at different levels and for individual classes, bearing in mind that it is not possible for all schools to achieve all necessary prerequisites and initiate ICT skills teaching.

The measure includes the following activities:

- 1.2.1 Revision of plans and curricula for classes and learning digital competencies;
- 1.2.2 Analysis of the success of the implementation of the curriculum for learning digital competencies;
- 1.2.3 Implementation of an educational campaign for children on the safe use of the Internet and usage of modern technologies (IT Caravan);
- 1.2.4 Organizing national school competitions in the field of digital skills;
- 1.2.5 Improving plans and curricula for classes and learning in order to acquire digital competencies in secondary vocational schools, in particular for the profiles of mechanical technician for computer construction, robotics technician, electrical technician of information technologies and electrical computer technician.

## **Specific objective 2. Improving basic and advanced digital skills for all citizens**

People with relevant digital skills can safely access news and information, communicate with friends and family and use important services such as e-health, e-government, digital finance “agro-tech”, “smart transport” and have many other benefits from participating in the global knowledge society. Data from various surveys indicate that almost half of the five billion people who own mobile phones (47%) mostly use their devices to make phone calls or send messages. As more people switch from ordinary to smartphones, another billion people shall soon have mobile Internet access, while many of them will skip the phase of using computers and ordinary phones by immediately switching to powerful handheld computers - smartphones. Therefore, there is a need for mobile literacy to bridge the gap between the use of phones for basic functions and the use of sophisticated smartphones. A special challenge is to raise the skills of certain categories of the population, such as the elderly, the less educated and the poor.

Measures to achieve specific objective 2 are taken with the aim of raising digital skills through a training system for citizens and include the following:

- 2.1 Providing conditions for the development of different levels of digital skills for citizens;
- 2.2 Accreditation of training programmes for the development of digital skills of citizens, with the development of models of increased access to citizens belonging to vulnerable categories, such as the elderly, people with disabilities and poor citizens or people from rural areas, as well as reducing gender disparities and inequalities in digital skills development;
- 2.3 Raising citizens' awareness of the need to acquire digital skills;
- 2.4 Improving digital skills for citizens at the local self-government level.

### *2.1 Providing conditions for the development of different levels of digital skills for citizens*

Measure type: Informative-educational measure

Institutions responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications, Ministry of Education, Science and Technological Development, Ministry of Labour, Employment, Veteran and Social Policy and Ministry of Public Administration and Local Self-Government

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Percentage of information and communication technologies usage by households and individuals

Verification source: Annual report of the Statistical Office of the Republic of Serbia

The conditions necessary for the implementation of this measure include defining different levels of digital skills for citizens, but also providing conditions related to the communication infrastructure within the territory of the Republic of Serbia.

The types of digital skills needed today are different from those needed only five years ago. It used to be possible to identify a specific set of digital skills that citizens would master through specific training programmes, covering topics such as basic hardware and software operations, email use, and searches. However, with the rapid development of this field, digital skills need to be updated due to the constant influence of new technologies and innovations, such as artificial intelligence, big data, blockchain, cloud computing, Internet of Things (IoT), machine learning and mobile applications.

Basic digital skills enable the execution of basic tasks and correspond to basic literacy, i.e. traditional literacy and basic knowledge of mathematics. Basic skills include knowledge of hardware (for example, using a keyboard and basic knowledge of touch-screen technology), software (for example, word processing, file management on a laptop, managing privacy settings on mobile phones), and knowledge of basic on-line operations (for example email, search or filling out on-line forms). Basic digital skills enable interaction with others and access to public, business and financial services, which is necessary for all citizens.

Having in mind the above, as well as the fact that training courses can be conducted by different subjects, it is necessary to define the required scope of knowledge concerning digital skills depending on the level, i.e. it is necessary to define what enables basic, intermediate and advanced levels of digital skills.

Training programmes should be provided through models that participants can afford so as not to be discriminatory, in particular for young people, poor citizens or unemployed adults. Programmes should also include the development of models for increased access to digital skills training for citizens belonging to vulnerable categories, such as the elderly, the less educated and the poor. It is necessary to envisage measures to provide funds for the development of digital skills through free or subsidized training for members of these groups, for which economic entities could be engaged within the framework of corporate social responsibility programmes. These programmes could also be subsidized through tax incentives, and in the case of employment opportunities after training, the costs could be reimbursed after employment.

Divisions based on gender, age and other personal characteristics in ICT have led to less involvement in this area of women, people with disabilities, the elderly and other marginalized groups. Therefore, it is necessary to pay special attention to measures to create more inclusive and equitable opportunities for groups that have less opportunities to use digital technologies and develop basic digital skills due to many reasons, such as age, social norms and expectations, physical ability, awareness, geographical area, level of education, price or others. Training of marginalized groups has the effect of reducing socio-economic disparities and building a more inclusive society. Otherwise, existing divisions shall continue to widen, further exacerbating socio-economic inequalities, such as lower incomes and even higher unemployment. In this area,

it is necessary to focus in particular on women and girls, people with disabilities, poor and elderly citizens, as well as citizens from rural areas. All these categories are permeated by young people who need special attention by adapting training to their characteristics and interests. Thus, for example, it is possible to organize special programmes for the development of digital skills that include only youth, such as programming camps or training courses for the development of mobile applications. Likewise, one of the possibilities is to include training courses in the field of digital skills within work practice and in educational and professional development programmes within certain sectors.

In this regard, it is necessary to adjust training plans and methods depending on the specificities of individual groups in order to make training more attractive and accessible to members of marginalized groups, which should be especially taken into account when determining the conditions for accreditation of training programmes. Achieving these goals requires that in certain cases lecturers - persons who hold training courses undergo prior training and acquire new skills, especially as regards to e.g. young people, entrepreneurs or people with disabilities. Trainers should become navigators through information and be able to find and use the most relevant resources in relation to the type of training and target group, hence it is necessary to train training providers how to adapt plans and training courses in a way that encourages professional development, entrepreneurship, workplace learning and employment.

#### Women and girls

According to data from earlier reports and research, women and girls are less likely to have access to ICT than their male peers. The ICT sector is growing very fast and is expected to provide well-paid jobs with a shortage of around 10 million professionals worldwide. Reducing the gender gap would have significant economic implications for consumer purchasing power, but also for company profits, as shown by numerous studies. In addition to the affirmation of the field of ICT among women and girls, special programmes for the development of advanced digital skills for young women could be launched, in particular in environments where higher unemployment or a higher digital gender gap has been observed.

It is necessary to design media and social media campaigns in order to raise awareness among members of marginalized groups, among parents, teachers, employers and the general public. Such campaigns would emphasize the importance of developing digital skills among women and girls and identify career development opportunities that require such skills. Such campaigns would counter the stereotype that advanced digital skills are accessible only to men. Adapting training in this regard may also mean that lecturers undergo training courses on gender bias, in order to maximally encourage girls to persevere in their interest in science and technology.

#### Persons with disabilities

Affordable technology and skills development programmes can enable people with disabilities to become entrepreneurs, acquire jobs in conventional sectors and find jobs in the

technology sector. However, people who have a physical or sensory disability are frequently excluded from digital technologies and the opportunities they offer. Although some progress has been made in removing barriers to the use of technology by people with disabilities, in particular through the development of accessible hardware and software, there is still a need for innovative solutions in order to support the inclusion of people with disabilities. Even with the growing range of useful technologies produced for people with disabilities, the question of their accessibility and affordability remains an issue. More advanced training courses can also support employment of people with disabilities in areas such as design, content development and site verification in terms of accessibility. Complementary training focused on developing soft skills and finding a job can also be helpful. For people with disabilities, it is necessary to identify available ICT solutions and provide training for the use of assistive technologies in an accessible space. For people with disabilities, there is a need for training programmes on the issue of creating accessible ICTs, such as accessible websites, mobile applications and devices.

#### Elderly population

A number of senior citizens do not have the basic digital skills that others have acquired at school or at their workplace. However, the need to keep track of information on modern devices, as well as the need to be in touch with friends and family and to have access to various services in society, necessitates the development of these type of digital interactive skills. Therefore, as many senior citizens as possible should be trained in basic digital skills, which include learning the basics of how smartphones and the Internet work together in delivering applications, information and messages, including skills to set up new accounts and create passwords, research, search, download and use network and mobile applications. These training courses could be realized in premises such as pensioners' clubs, libraries, retirement homes, and so-forth. Positive effects could also be achieved through peer education, in such a way that trained older people would provide further training in basic digital skills

#### Poor citizens

In addition to the above categories of the population, special attention, especially from the aspect of poverty reduction and social inclusion, needs to be paid to poor citizens. Social work centres and local self-government units have a vital role here. Namely, the social work centres have the opportunity not only to recognize the most endangered citizens who need to be provided with training, but also have the possibility to provide the necessary space and other capacities for conducting training courses. Local self-government units can also play an important role in providing funding for free or subsidized training aimed at digital skills development, but also in providing other conditions, such as premises and equipment. Educational institutions, as well as the National Employment Service, could be involved in these activities. Furthermore, training courses for poor citizens could also envisage the employment of those who acquire higher levels of digital skills, with the possibility of attending more training courses depending on one's abilities and achieved results.

## Population from rural areas

The precondition for conducting training courses for the development of digital skills in rural areas is, primarily, ensuring the availability of the Internet, i.e. access to communication infrastructure. Furthermore, the development of digital skills in rural areas implies a specific approach in terms of enabling “travelling” training courses, namely the arrival of lecturers to the area where training is conducted. Moreover, it is significant to consider manners of providing information on the implementation of such training courses for as many people as possible.

Access to training should be provided to persons from rural areas who intend to start their own business, as well as for small entrepreneurs and craft shops. Conducting training courses among young entrepreneurs on how to use ICT and other business, technical and soft skills they need as digital entrepreneurs, would have an impact on the survival and growth of any business.

A special aspect that could have positive effects on the development of basic digital skills in the general population is the provision of on-line training. Massive open on-line courses (MOOCs), YouTube video material, interactive learning modules and other resources that are free and accessible allow you to easily and quickly acquire basic digital literacy. Therefore, it is necessary to create simple and easily accessible content about the use of individual devices, how to use them and the possibilities they provide. This content should be updated regularly.

On the other hand, the construction of broadband communication infrastructure within the entire territory of the Republic of Serbia is a precondition for achieving not only this specific, but also the general goal of the Strategy, in order to create objective possibilities for using acquired knowledge and skills. In that sense, it is necessary to provide broadband communication infrastructure in those areas of the Republic of Serbia that have not been covered so far, and this primarily refers to rural areas, i.e. local self-government units or their parts where there is no economic interest or operator's plan to build access FTTH networks. . The implementation of this measure implies the construction, but also the creation, of incentive models for the construction of these types of networks for operators by the Government, but at the same time covers local self-government initiatives.

The measure includes the following activities:

2.1.1 Assessment of the current state of digital skills among citizens in the Republic of Serbia and individual local self-governments and development of guides on digital skills for all citizens;

2.1.2 Development of models for increased access to digital skills training for citizens belonging to vulnerable categories, such as the elderly, people with disabilities and poor citizens or people from rural areas, as well as reducing gender disparities and inequalities in the development of digital skills;

2.1.3 Support to training programmes and educators in the field of digital skills development for citizens;

2.1.4 Improvement of broadband communication infrastructure within the territory of the Republic of Serbia;

2.1.5 Implementation of training programmes for improving the digital skills of women from rural areas.

## *2.2 Accreditation of training programmes for the development of digital skills of citizens*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications, Ministry of Education, Science and Technological Development and Ministry of Culture and Information

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of accredited programmes

Verification source: Reports of the Ministry of Education, Science and Technological Development

Given the speed of technological change, non-formal education is an important part of the Strategy as it creates opportunities for learners of all ages to acquire new skills. Non-formal education can be offered in a number of locations, including public libraries, local internet clubs, NGOs, evening schools, retirement clubs and other local spaces. Non-formal education includes national, regional or international campaigns, depending on the interests shown by local communities, activities at the level of the Republic, such as providing incentives and involvement of certain relevant institutions, like old people's homes and social work centres, cultural institutions, as well as incentives to the non-governmental sector, and so-forth.

Public libraries are the main channel for learning digital skills in many countries. Worldwide, there are over 300,000 public libraries, 70% of which are located in developing countries. Public libraries offer a number of benefits: local community presence, physical infrastructure, qualified professionals and a sustainable model of public funding. Local internet clubs also play a vital role in national digital inclusion initiatives, in particular in rural areas. Like libraries, local internet clubs usually have a public mission and are fully or partially supported by public funds. As such, they can provide free or cheap access to computers and training courses, as can local communities, youth offices and other facilities that already exist with almost fully provided infrastructure.

NGOs and clubs offer a number of opportunities for non-formal learning, frequently aimed at providing services to job-seekers, marginalized groups, young people who have completed their education, the elderly or self-organized groups of people who gather to develop their skills.

Non-formal education and training opportunities allow for greater innovation and timeliness compared to formal education systems.

In that sense, it is possible to establish dynamic, peer teaching, regardless of which group is in question (youth, elderly, poor or people from rural areas). An interactive and peer-to-peer approach to teaching provides excellent results in all aspects of social life.

Workshops are another important dimension in the context of digital skills development. Workshops are a shared, collaborative space where people can explore their interests and create and fix things using a variety of tools and materials. Workshops provide resources and guidance to help people gain hands-on experience in electronics, robotics, programming, and 3D modelling. Many workshops are located in schools, libraries and similar spaces. Workshops also provide support to entrepreneurship and promotion of start-ups. They also help young people acquire problem-solving skills and motivate them to seek a career in ICT. Workshops can also be integrated into training programmes in the field of developing work-place related digital skills or into primary and secondary schools to provide opportunities for participants to experiment and further develop acquired skills.

The process of accrediting training programmes should be fast and objective, with well-defined conditions that training organizers need to meet in order to achieve the best effects. These conditions refer to premises and the regulation of a system of competencies for lecturers who transfer digital skills and knowledge, with the establishment of mandatory additional training and monitoring of ICT development, as well as an appropriate training plan and material depending on the level of digital skills.

Through the accreditation of training courses, it is necessary to prescribe innovation of knowledge among lecturers, mandatory additional training and monitoring of ICT development, as well as supervision of this process. Lecturers and instructors should improve technical skills and the way knowledge and skills are transferred at appropriate intervals, in order to reduce the gap between what educational institutions offer and what employers and citizens need for work and life. The curriculum and training materials must be in accordance with the training programme and follow trends.

Appropriate training plans and material must be critically evaluated to ensure that they cover the necessary and appropriate skills, competencies and tasks depending on the level of digital skills needed, not only for the present, but also for the future. Training programmes and plans need to be updated in line with advancements in technology and citizens' needs. In this sense, it is necessary to develop schemes for updating programmes, training plans and teaching material.

Moreover, within this measure, in addition to considering the conditions for accreditation of informal training providers and their programmes, it is necessary to compile and regularly update the available list of accredited providers with specific training courses for which they are accredited, or with a specific type of training, its duration, the location where the training is conducted, category of citizens it can include and other necessary information.

The measure includes the following activities:

2.2.1 Encouraging organizations and institutions that have acquired the status of Publicly Recognized Organizers of Activities (PROA) for the implementation of programmes for the acquisition of professional competencies in the field of digital skills;

2.2.2 Encouraging the organization of training of trainers (ToT), with the encouragement of all forms of peer education for the development of digital skills among citizens;

2.2.3 Promoting peer to peer education and the exchange of good practices through the organization of events, the publication of professional publications and the development of on-line portals;

2.2.4 Establishment of various training models for the development of digital skills among citizens within public spaces, “travelling” trainings, as well as on-line training programmes through mass open on-line courses (MOOCs).

### *2.3 Raising citizens' awareness of the need to acquire digital skills*

Measure type: Informative and educational measure

Institution responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of citizens shopping on-line

Verification source: Annual report of the Statistical Office of the Republic of Serbia

In parallel with the processes related to the accreditation of training programmes, it is necessary to conduct campaigns aimed at raising citizens' awareness of the need to adopt digital skills and increase the level of interest, particularly among certain sensitive social groups, on the need to acquire digital skills for the purpose of integrating into modern society. These campaigns should also be coordinated between systems and monitored by the Government itself, bearing in mind that they are covered by TV spots, as well as newspaper articles, social networks, including the non-governmental sector, and target social groups with different interests and needs.

Campaigns and other initiatives to raise citizens' awareness of the need to adopt new digital skills initiated by multiple stakeholders should serve as a means to build awareness and motivate people to learn digital skills. It is necessary to organize local and regional campaigns depending on the results shown by the research of the Statistical Office of the Republic of Serbia and join existing global campaigns. These campaigns should cover a wide range of stakeholders and focus on: raising awareness, initiating partnerships with the industry, target groups within the population or parts of the country.

The achieved results in terms of the scope of computer literacy among citizens must be regularly reviewed, in order to gain insight into the progress made and create further activities and accessible content, but also to include as many residents as possible. A good basis for reviewing the results achieved at the national level are certainly surveys conducted by the Statistical Office of the Republic of Serbia on an annual basis. However, in order to respond to specific needs in a particular area, local self-government units could play an important role, which implies prior consideration of needs in their area and coordination of activities in order to achieve cooperation between educational institutions, the National Employment Service, social welfare centres, the non-governmental sector and other entities involved in this process. Subsequently, it is necessary to regularly monitor the coverage of persons involved, their characteristics, as well as the level of achieved skills and knowledge.

The measure includes the following activities:

2.3.1 Conducting campaigns to raise awareness of citizens (consumers) of the need to adopt digital skills in the modern digital age, in particular in the field of electronic commerce;

2.3.2 Educating and informing citizens (consumers) through internet websites and social networks (Facebook, Instagram), as well as through TV and radio shows, on the benefits of using digital technologies;

2.3.3 Creating video and audio on-line content in the fields of digital skills to support citizens in specific situations on popular communication channels such as Youtube, Instagram, Podcasts, Snapchat, and so-forth;

2.3.4 Providing continuous support to children and parents regarding smart and safe use of the Internet (through the National Contact Centre for Child Safety on the Internet);

2.3.5 Involvement in the work of international bodies/ organizations in the field of protection of minors in the digital world and marking the World Safer Internet Day.

#### *2.4 Improving digital skills for citizens at the local self-government level*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: Ministry of Public Administration and Local Self-Government, Ministry of Trade, Tourism and Telecommunications and Office for Information Technologies and E-Government

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of local self-government units that provide electronic services to citizens at the level of e-government

Verification source: National e-government portal

Local self-governments, in accordance with their competencies, have the opportunity to possess the basic preconditions in terms of providing adequate space and allocating appropriate funds for the implementation of activities related to the improvement of digital skills among citizens. All training programmes require space, electricity, internet connection and good equipment. On the other hand, local government units are places where people live and work, they possess data on the structure of the population within their territory and are able to perceive both the needs of local economic development and the needs of individuals within their territory. Furthermore, local self-governments have the capacity to coordinate certain activities within their territory, as well as to monitor achieved results. Therefore, local self-governments play an extremely vital role in this process. Activities that would be carried out in terms of developing digital skills of citizens within the territory of the local self-government unit have positive effects on local economic development, poverty reduction and increasing employment rates, which is in the interest of every local self-government. Having in mind the above, local self-government units should, within the framework of local development programmes, namely through local

employment action plans, review the existing situation and anticipate appropriate activities, as well as provide (financial) support to digital skills development programmes or create new programmes.

A special aspect of the implementation of this measure is cooperation with the civil sector at the level of local self-government, especially bearing in mind that the civil sector brings together certain groups of citizens, knows their characteristics and specifics, and often has the capacity to provide support, whereby it can provide very good answers to filed requests, in particular as regards to, for example, young people, people with disabilities, the elderly, etc. In addition, cooperation with employers and employers' associations provides information on needs, whereby it is necessary to use the capacity of the civil sector in the field of ICT. This cooperation can be realized through project financing of certain activities related to the improvement of digital skills among citizens. Local self-governments should also conduct training courses for the development of digital skills among local government employees, as well as create as many e-services as possible, simultaneously promoting and training citizens for their use.

The measure includes the following activities:

- 2.4.1 Increasing the level of digital skills among employees in local self-government units;
- 2.4.2 Creating a guide through e-services for citizens and their (media) promotion;
- 2.4.3 Creation of local coalitions for the development of digital skills and implementation of training programmes in the field of digital skills and competencies development among citizens;
- 2.4.4 Support for digital skills development programmes at the local self-government level.

### **Specific objective 3. Development of digital skills in relation to the needs of the labour market**

The digitalization process has already covered all areas of society and the economy, whereby digital skills are needed for almost every job. Most positions require knowledge of basic digital skills, but it can be expected that the need for these skills shall grow, and not only in relation to basic skills, but also more advanced that are related to the specificities of a workplace. In the field of work, digital skills qualify individuals for work not only in conventional areas of the labour market but also open the door for participation in new sectors, as well as opportunities to start one's own business. People who have mastered more advanced digital skills can also take advantage of a much wider range of opportunities created by the constant advancement of digital technologies and devices. Digital skills are particularly important given the changing nature of the work environment, including the sharp increase in the number of people working in informal forms of work in this field, as well as broader structural changes that will greatly affect job design in the future. Intermediate-level skills enable the use of digital technologies in more meaningful and useful ways, including the ability to critically evaluate technology or create content. Such skills prepare an individual for work because they include knowledge and abilities needed to perform business activities such as prepress, digital graphic design, digital marketing and so-forth. Mastering these skills implies

readiness to perform a wide range of digital tasks. However, mastering these skills does not achieve lasting results. On the contrary, one of the specific characteristics of mid-level skills is that they are constantly expanding to keep pace with technological changes. For example, data skills must be constantly strengthened due to the fact that a real revolution is taking place in the data sphere that creates the need for skills necessary for the production, analysis, interpretation and visualization of large amounts of data. Therefore, especially when observing the labour market, certain skills are not only needed, but must also constantly be improved, in order to be capable of following new technologies and developments in the field.

Having in mind the above, this goal implies several aspects, whereby measures to achieve specific goal 3 are taken with the aim of raising digital skills through:

- 3.1 Meeting labour market needs for digital skills at all levels and promoting opportunities in the ICT sector;
- 3.2 Creation and implementation of active employment policy measures in relation to effects in the field of ICT;
- 3.3 Improving cooperation between relevant institutions;
- 3.4 Development of digital skills among employees, including employees in public administration, with a focus on digital skills that are related to workplace specificities.

*3.1 Meeting labour market needs for digital skills at all levels and promoting opportunities in the ICT sector*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: Ministry of Labour, Employment, Veteran and Social Policy, Ministry of Education, Science and Technological Development, Ministry of Finance, National Academy for Public Administration and Ministry of Trade, Tourism and Telecommunications

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Percentage of companies in the Republic of Serbia that report that digital skills are mostly, or not at all lacking among their employees.

Verification source: Survey of 1000 companies, USAID Economic Development Cooperation Project

The National Employment Service provides services related to, inter alia, employment mediation, career planning counselling, subsidized employment and entrepreneurship support, additional education and training, incentives for cash benefit recipients, support to local self-governments in implementing programmes or active employment policy measures, encouraging the employment of people with disabilities and other affairs. Having in mind this scope of competences, the National Employment Service is and can be one of the basic bearers of implementation not only of the measure aimed at developing digital skills for unemployed persons, but also of other measures envisaged by specific objective 3, whereby it can and should

actively participate in the realization of other specific goals, primarily in view of the cooperation it achieves with employers and local self-governments, as well as with the education system and other entities.

Having in mind the competencies and tasks of the National Employment Service determined by law, but also considering achieved results, room for action in the implementation of this measure is quite large. According to the Report on the work of the National Employment Service for 2017<sup>71</sup>, out of the planned 1000 people, 778 were covered by specialist IT training courses, however, not one person with a disability was included. As regards to the type of training, the Training Catalogue for Unemployed Persons with Disabilities in 2017 provides the following: basic IT training for blind and partially sighted people, basic IT training for deaf and hard of hearing people, basic IT training, WEB workshop, basic IT training according to the ECDL standard.

Taking into consideration the aforementioned competencies and capacities, the National Employment Service can include a larger number of unemployed persons through training courses that provide basic digital knowledge and skills, but also enable the acquisition of digital skills of intermediate or advanced level through retraining and additional training programmes, based on the perceived needs of employers in a specific, local labour market. Moreover, the National Employment Service may, in cooperation with employers, participate in financing the costs of training conducted by employers themselves, namely for their own needs, in order to influence retention of workers who are already employed by those employers, but do not have the appropriate knowledge and skills or need to improve that knowledge. The National Employment Service works in cooperation with employers, as well as with local self-governments and other entities such as social work centres, the civil sector, educational institutions and others.

Training programmes for the development of digital skills and knowledge should be implemented in combination with training courses that include the development of “soft” business/ entrepreneurial skills on a larger scale, in particular for young unemployed persons and certain categories of hard-to-employ persons, taking into account the effects of all implemented programmes in relation to the goals that need to be achieved when observing the establishment of gender balance in the field of employment opportunities in the ICT sector, employment of persons with disabilities, users of social protection measures and services, and so-forth. In this regard, the National Employment Service should regularly review which programmes work best with marginalized groups, which have the best effects in terms of the number of employees post-programme, which provide the best combination of strong and soft skills that can be applied immediately and so-forth, and subsequently conduct such training courses. A special segment of the role of the National Employment Service includes the promotion of career development opportunities through counselling and professional orientation not only of the unemployed, but also of those who are still in school.

---

<sup>71</sup> Available at: [http://www.nsz.gov.rs/live/digitalAssets/9/9467\\_izvestaj\\_o\\_radu\\_i\\_-\\_xii\\_2017.pdf](http://www.nsz.gov.rs/live/digitalAssets/9/9467_izvestaj_o_radu_i_-_xii_2017.pdf)

The measure includes the following activities:

- 3.1.1 Monitoring the demand for digital skills at the national and local levels;
- 3.1.2 Harmonization of the National Qualifications Framework (NQF) with the European Qualifications Framework (EQF) in terms of digital skills;
- 3.1.3 Promoting career development opportunities through the advancement of digital skills through counselling and career guidance
- 3.1.4 Creating an on-line tool for self-assessment of digital skills and recommending the development of missing skills in accordance with the profile of a candidate and demand on the labour market;
- 3.1.5 Creating training packages for several levels of digital skills, with the inclusion of modules related to the development of entrepreneurial skills;
- 3.1.6 Development of a part of the training catalogue on an annual basis in relation to the needs of the labour market for the improvement of digital skills.

*3.2 Creation and implementation of active employment policy measures in relation to the effects in the field of ICT*

Measure type: informative-educational

Institutions responsible for the implementation of the measure: Ministry of Labour, Employment, Veteran and Social Policy, Ministry of Trade, Tourism and Telecommunications

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of employees six months after completing an active employment policy measure

Verification source: Report on the work of the National Employment Service

In accordance with established competencies, the National Employment Service, in addition to the above, also performs tasks related to the implementation of active employment policy measures through support to employment and self-employment of unemployed persons, such as: subsidy programmes for starting-up one's own business; professional and financial support for self-employment of persons establishing some form of entrepreneurship or company, subsidies for self-employment and mentoring services; financial support to companies that plan to hire unemployed for newly opened jobs, and so-forth.

When looking at the achieved results according to the Report on the work of the National Employment Service for the period January-December 2017<sup>72</sup>, for example, employment subsidies directed to employers were awarded to 2,721 unemployed persons, 116 persons with disabilities, and 843 persons through co-financing with local self-governments. Within the measures related to the encouragement of self-employment, various measures over the course of 2017 covered 3,680 persons. The work plan of this service for 2019<sup>73</sup> envisaged the

---

<sup>72</sup>Available at: [http://www.nsz.gov.rs/live/digitalAssets/9/9467\\_izvestaj\\_o\\_radu\\_i\\_-\\_xii\\_2017.pdf](http://www.nsz.gov.rs/live/digitalAssets/9/9467_izvestaj_o_radu_i_-_xii_2017.pdf)

<sup>73</sup>Available at: [http://www.nsz.gov.rs/live/digitalAssets/11/11601\\_program\\_rada\\_nsz\\_2019.pdf](http://www.nsz.gov.rs/live/digitalAssets/11/11601_program_rada_nsz_2019.pdf)

implementation of a package of services for unemployed persons who have priority of inclusion in active employment policy measures for redundant employees, as well as for young people up to 30 years of age, persons without qualifications, low-skilled and long-term unemployed persons, and persons with disabilities from the records of the National Employment Service. The work plan also envisaged cooperation with social partners in the implementation of active employment policy measures, as follows: co-financing of active employment policy programmes or measures envisaged by local employment action plans, cooperation with social work centres on the provision of integrated services for able-bodied beneficiaries of financial social assistance, cooperation with employment agencies, etc.

Considering the possibilities for creating and implementing activities through a combination of different active employment policy measures aimed at individuals who achieve more permanent and sustainable employment is necessary in modern business conditions. In that sense, for example, a great effect on the ICT sector would be creating conditions for establishing start-up centres in which entrepreneurs who start their own businesses could be provided with professional, mentoring, legal, advisory and logistical support for a certain period of time in order to initiate and run their business. Possibilities for future action also lay in the fact that the National Employment Service provides support to local self-governments in the implementation of active employment policy programmes or measures within the territory of these local self-governments.

The measure includes the following activities:

3.2.1 Implementation of certified/ accredited training programmes in areas of digital skills relevant to employment, which include the development of “soft” business/ entrepreneurial skills within the training programmes, with special reference to women entrepreneurs;

3.2.2 Implementation of a package of services involving persons participating in multiple measures and training courses at several digital skills levels, with the inclusion of modules related to the development of entrepreneurial skills;

3.2.3 Strengthening local start-up centres by implementing active employment policy measures that include training, professional, mentoring, legal, advisory and logistical support in the field of ICT;

3.2.4 Establishment of special measures for investment in employees’ digital skills in the sector of small and medium enterprises (introduction of education programmes for employees in small and medium enterprises in the field of digital skills through the allocation of ICT vouchers, training at the request of the employer, etc.).

### *3.3 Improving cooperation between relevant institutions*

Measure type: Informative-educational

Institution responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of held events

Verification source: Reports of the Ministry of Trade, Tourism and Telecommunications

The implementation of most of the envisaged measures indicates the need to achieve close cooperation between individual stakeholders. Not one goal of the Strategy can be achieved, first and foremost, without the cooperation of the education, labour, employment, telecommunications, science, social protection, and economy sectors, but also other systems at the national level. On the other hand, the needs of the labour market are impossible to perceive and satisfy without cooperation between employers, public administration and local self-government, the National Employment Service, schools and universities, the civil sector and other entities at the local level. In order to provide an appropriate, rapid response to the needs of the labour market, it is insufficient to introduce digital skills learning in educational programmes, namely one must create flexible curricula that can provide an effective response to the needs of employers, including the state as an employer. It is especially crucial to monitor the needs of the labour market in terms of creating different educational profiles.

During the realization of the set goals, it has thus been emphasized that certain activities need to be carried out jointly, but having in mind the importance of such action, this measure is particularly emphasized within the specific goal of meeting labour market needs because the development of digital skills among as many people as possible is being implemented with the ultimate goal of developing the entire economy, raising the level of employment and employing skilled and trained workers.

Mutual cooperation needs to be constantly monitored and improved, for which it is necessary to determine the responsible institutions in order to achieve the best effects. In addition, it is necessary to involve international organizations in joint activities, with the establishment of contacts with domestic and international donors to support the development of digital skills.

The measure includes the following activities:

3.3.1 Establishment of a professional body/ coalition for digital skills (consisting of representatives of the economy, academia, public sector, trade unions and relevant decision makers) with the aim of understanding the needs for digital skills, exchanging information and good practices, developing models for involving employers in the establishment and development of study programmes, and so-forth;

3.3.2 Organization of campaigns and events to raise awareness of the need for digital skills and future technological occupations (festivals, conferences, professional gatherings, digital skills fairs, etc.);

3.3.3 Identifying and rewarding digital champions among employers in the areas of investing in employee digital skills;

3.3.4 Encouraging joint public and private sector projects to improve digital skills.

*3.4. Development of digital skills among employees, including employees in public administration, with a focus on digital skills that are related to workplace specificities.*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications, Ministry of Education, Science and Technological Development, Ministry of Labour, Employment, Veterans and Social Policy and the National Academy for Public Administration

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of persons who have completed training courses for the improvement or development of digital skills

Verification source: Reports of the National Academy for Public Administration

In addition to the already mentioned activities carried out by the National Employment Service, within this goal it is necessary to put emphasis on the role of employers and their associations, as well as the role of educational institutions in terms of educating people with qualifications needed by employers in modern conditions of rapid progress.

Technical and vocational schools, as well as universities, play a significant role in developing the appropriate skills of students. The development of appropriate occupations and the acquisition of knowledge in the field of digital competencies through education provides the best response to the needs of the economy. Therefore, it is necessary for the school system to follow these needs and provide adequate answers to them. Given the rapid development of this area, it is not to be expected that once determined educational profiles and curricula shall not change over the years. In this regard, it is necessary to constantly, in cooperation with various entities under impact on the labour market, monitor the needs for possessing appropriate knowledge and skills and respond to such needs as soon as possible by opening new departments that provide training related to existing occupations and by creating new educational profiles in line with technological developments, changes or corrections to existing curricula and other measures. Furthermore, cooperation with employers means providing work practice, mentoring and other forms of support between the education and labour systems.

A special segment of this measure are the activities of employers themselves, which enable their employees to acquire or improve knowledge in the field of digital skills in order to maintain competitiveness and achieve the best effects in market competition. These activities can be undertaken by the employers themselves, but it is also possible to carry them out in cooperation with a local self-government or the National Employment Service. Employers'

associations and chambers of commerce have an important role in this process, as does the exchange of experiences and the promotion of examples of good practice. When considering the needs and engaging in various necessary training courses, special attention should be paid to improving the knowledge of managers (“eLeadership” skills). Managers are those who in practice have a significant role in relation to the employees themselves and the effects of their work, but also to the overall productivity and competitiveness of enterprises.

The measure includes the following activities:

3.4.1 Monitoring the demand for digital skills that are related to the specificities of a workplace;

3.4.2 Encouraging the development of training for employees in individual sectors at higher levels of work complexity;

3.4.3 Development of models for validation and certification of digital skills acquired through non-formal education;

3.4.4 Establishment, improvement and promotion of special training courses for public sector employees in the field of digital skills.

#### **Specific objective 4. Lifelong learning of ICT professionals**

Numerous researches indicate that in the coming years, there shall be tens of millions of jobs in the world for those who possess advanced digital skills in the field of development of artificial intelligence, big data, coding, cyber security, Internet of Things and mobile applications. With the process of digitalization, there has been a greater need for ICT experts in all areas of society and the economy. Research predicts that there shall be a shortage of workers with advanced digital skills, and that the need for ICT professionals will record the largest growth in the labour market. Many employers are already unable to find workers with the necessary skills, although jobs that require advanced digital skills are usually paid much better than others.

Residents of the Republic of Serbia are showing great interest in the use of ICT products and services. It should be noted that this interest is not entirely unexpected, bearing in mind that in the 1970s and 1980s, the Republic of Serbia, as part of Yugoslavia<sup>74</sup>, was one of the global leaders in computer sciences, which is the forerunner of what is now called the ICT field. It turns out that even despite the wars in the region, the bombings, sanctions hindered economic development of the 1990s, the delayed and prolonged transition, the weakened economy, as well as the significant and continuous outflow of experts in this field, general knowledge nor individuals who possess it still exist. Secondly, the existing significant development of ICT, which was clearly recognized by the state, is primarily a result of efforts made by people involved in this field. That this is really the case can be observed by the impressive success of individuals and companies, which far exceed the borders of the Republic of Serbia. Third, but not

---

<sup>74</sup> Full name Socialist Federal Republic of Yugoslavia

least, is the fact that ICTs by their nature enable individuals and companies to place their knowledge and skills on the global market where there is a demand for it. High demand shows that there is a need in the market for a certain type of goods/ services and a willingness to valorise those goods/ services in an appropriate manner. With this in mind, it turns out that one of the main challenges in this area is not only the development of new and improvement of existing ICT experts, but also the issue of the extent to which the Serbian market, given the current economic situation, can meet such a complex market demand for ICT services. In this regard, the long-term joint task of the competent authorities and stakeholders is to find ways to employ domestic experts and apply their knowledge for the development and well-being of the country. Otherwise, investments in ICT professionals shall be reduced to the export of a smart labour force.

Over the course of 2017, there were 2,163 active companies in the Republic of Serbia whose individual annual income was more than one million dinars. Observed by activity, most were software companies (1,343), which is 62% of the total number of IT companies, of which 350 are with foreign founders. Observed by size, the total number of IT companies is dominated by micro companies (less than 10 workers), of which there were 77.7%, while only 10 companies employ more than 250 workers.<sup>75</sup>

In 2018, more software companies were established in the Republic of Serbia than ever before. Practically it can be said that the complete vitality of the IT industry derives from software companies, but it should be borne in mind that the journey from a beginner to a large company, on average, takes more than a decade. Domestic companies face objective growth limits that are a consequence of the strong influence of global factors on the domestic information industry and the weakness of the domestic environment, which is why they usually involve foreign partners in their activities or move them outside the Republic of Serbia. Currently, eight of the ten leading software companies in our market are foreign-owned. Those companies attract even the most professional staff, as personnel is acquired by the ones who can adequately pay. The lack of high-quality IT experts for development, programming, design and web design is becoming more pronounced.

During 2017, the total number of employees in the IT sector reached 25,890 workers, which is 74% more than in 2011, so that the average annual growth rate in the period 2011-2017 amounted to 9.7%.

Of the total number of employees in the IT industry, IT professionals make up 2/3, while the rest are employees in sales, administration and management. This may seem like a modest number compared to about 1.5 million employees in all enterprises and institutions. However, freer estimates say that this number is only part of a larger corps of close to 60,000 IT professionals, which in addition to the IT sector includes an additional potential of about 35,000 people employed in the telecommunications sector, by enterprises - IT users and within entrepreneurial ICT circles.

---

<sup>75</sup> SITO 2018, IT industry of Serbia 2017-2018

Compared to 2011, all IT activities, except for trade in computer equipment, were characterized by increased employment, which confirms the developmental character of IT activities. In the meantime, the structure by activities has also improved: programming and IT services together employ 86% of workers, which is about 20 percentage points more than in 2011. This healthy part of the industry provides the basis that shall mitigate any stronger impacts on the employment policy of the IT industry. A reduction in the number of employees can be expected in hardware companies (PC equipment). The number of certified professionals in these categories is very small. These companies have not been able to retain IT professionals for many years, so they have lost their competitiveness and are facing a further decline in importance within the overall IT industry.<sup>76</sup>

The need for education of experts in the field of informatics was recognized in the 1980s by the Faculty of Electrical Engineering, Mathematics and the Faculty of Organizational Sciences of the University of Belgrade, the Faculty of Electronics of the University of Niš and the Faculty of Technical Sciences and the Faculty of Science in Novi Sad. These faculties are still the main carriers of higher education, research and development in the field of ICT, and on average about 2,000 ICT experts graduate from them annually. Presently, after four decades, in the Republic of Serbia there are 53 educational institutions in this area, 14 within state universities, 18 within private universities and 21 are high schools, of which 17 state-owned. These institutions are deployed in 23 cities, which makes a solid and broad base for recruiting ICT students. The historical legacy of forming educational centres near industrial centres has shown to be an excellent practice<sup>77</sup>.

In the period 2012-2017, the number of freshmen grew at an average annual rate of 13.9%. Over the course of 2017, there was an impressive increase in the number of freshmen, when compared to 5,523 ICT freshmen in 2012, the number almost doubled to 10,605 freshmen<sup>78</sup>.

The number of students who enrol in the first year of ICT studies directly affects the number of future professionals who can be counted on in three to five years from enrolment. About 60% of students graduate with a degree. Some students are acquire employment during their studies, which means that most of them never graduate.

The number of students graduating from private universities is growing from year to year, but is still relatively small (504 or 9.5%). Tradition and finances are on the side of state institutions, since more than 80% of the costs of ICT studies at state universities are covered by the state from the budget, while students at private faculties are almost 100% self-financing.

The realistic estimate is that the Republic of Serbia can count on about 3,500 out of 5,244 graduated ICT experts in 2016, bearing in mind that the remaining part shall continue their

---

<sup>76</sup> SITO 2018, IT industry of Serbia 2017-2018

<sup>77</sup> SITO 2018, ICT Human Resources and Education in Serbia 2017-2018

<sup>78</sup> Note: freshmen of basic academic and basic vocational ICT studies were taken into account

studies at the second and third level of studies. The reform of higher education and the increased number of newly enrolled ICT students should still give positive results, so it seems reasonable to estimate that in the coming period the Republic of Serbia can produce more than 4,000 ICT experts annually.

The rapid development of ICT has led to the fact that information and communication technologies are present in almost all areas. The consequence is that it is increasingly difficult to determine the boundaries of the ICT field, and thus what is meant by the term ICT experts. The term ICT professionals used in this strategy implies the following:

1) in the narrow sense: highly educated staff who have fundamental, theoretical and practical knowledge in the field of ICT;

2) in a broader sense: staff who have informally acquired knowledge in the field of ICT and have the appropriate evidence, attestation or certificate for it, i.e. proven by practical application.

Relying on the identified trends and challenges in the field of ICT experts, the basic role of ICT (connecting and networking), as well as the approach from agile methods, measures to achieve specific goal 4 are taken to raise digital skills of ICT professionals through:

- 4.1 Monitoring the needs of the economy and ICT sector;
- 4.2 Monitoring the number of young people, especially women, who are educated and trained for ICT occupations;
- 4.3 Raising research capacities in the field of ICT;
- 4.4 Improving the skills of ICT professionals and promoting lifelong learning.

#### ***4.1 Monitoring the needs of the economy and the ICT sector***

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: The Ministry of Trade, Tourism and Telecommunications and the Ministry of Education, Science and Technological Development

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Use of ICT in enterprises

Verification source: Annual report of the Statistical Office of the Republic of Serbia

Investments in human capital are a special challenge for further development of education and faster growth of the economy. A dynamic environment requires proactive actors - new partnerships, programmes and initiatives that include innovative approaches aimed at linking learning and employment opportunities. In that sense, it is necessary to create appropriate educational programmes that meet the needs of employers, which requires good and continuous

cooperation between higher education and the economy, not only when considering necessary competencies, but also in the process of learning and gaining practice, which should be done within IT companies. Multi-sectoral partnerships are particularly crucial for the implementation of advanced digital skills programmes. Specialized teams comprised of representatives from the ranks of the IT industry, schools, higher education institutions, public sector agencies and local organizations can be an important bridge between the supply of talent with the right skills and the demand for specialized skills. By regularly monitoring needs and exchanging knowledge, the curricula could be updated in accordance with achieved technological progress and expressed needs of the economy.

In order to be capable of following digital skills trends, whether in the economy or in the ICT sector, it is necessary to have standardization and certification. The experience of developed countries shows that cooperation between science, education, business entities and state institutions is easiest to establish with the help of appropriate government bodies that cover certain ICT areas. The introduction of ICT simply requires institutionalization. In order to achieve the full effects of the introduction of ICT, system and systemic action are needed, for which it is necessary to have competent institutions at the state level.

Education is a key issue that affects the potential of the Republic of Serbia for the accelerated development of the digital economy. Modern educational concepts in the digital segment and the field of economics require very close cooperation between the academic and business sectors. The low level of such cooperation and the lack of clear mechanisms for improving this cooperation pose a significant threat to the successful adaptation of the education system to the needs of digital society development. In addition, formal education does not keep pace with the emergence of non-standard ways of working that are a consequence of globalization and digitalization. The ICT sector is particularly prone to non-standard forms of employment. One of the disadvantages of modern education is that students are not encouraged to follow trends on the labour market and the demand for certain profiles. In addition, modern ICT experts, in addition to knowledge in the field of ICT, should have knowledge in the field of business, organization, management and decision-making at all levels, in particular as regards to strategic decisions. Improving digital skills shall not be possible unless curricula are innovated at all levels of education, especially at colleges. For the realization of continuous education, it is necessary to actively involve companies from the ICT sector, chambers of commerce, ICT clusters and other professional organizations, as well as organizations in the field of business, management, organization and planning.

The need to harmonize the needs of the economy with education makes professional associations, such as ICT clusters, entities of state importance. The strategic partnership of ICT clusters in the Republic of Serbia was expanded in 2018 and now includes six clusters that are, in addition to the domestic market, active internationally<sup>79</sup>. Communication and cooperation between the state, education and the economy is necessary for the implementation of the Strategy. The role of existing and newly created clusters, as well as of the Chamber of Commerce

---

<sup>79</sup> ICT in Serbia At a Glance, 2018 ([www.vojvodinaICTcluster.org](http://www.vojvodinaICTcluster.org))

of the Republic of Serbia, as an actor whose role is vital for permanent education and training, should not be neglected. The direct connection of the Serbian Chamber of Commerce and clusters with companies enables a more efficient and clearer assessment of the needs for certain staff, as well as of the knowledge and skills they should possess.

The measure includes the following activities:

4.1.1 Establishment of an integrated national qualifications framework (NQF), as well as the establishment of a national classification of occupations (NCO) for the field of ICT professionals, in accordance with the requirements and needs of the economy;

4.1.2 Forming a profile of the ICT sector (in relation to the existing document, make ICT specific and interactive);

4.1.3 Regular statistical monitoring of the ICT sector;

4.1.4 Improving student portals by singling out the section for ICT supply and demand.

*4.2 Monitoring the number of young people, especially women, who are being educated and trained for ICT occupations*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: The Ministry of Trade, Tourism and Telecommunications and the Ministry of Education, Science and Technological Development

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of girls enrolled in ICT-related studies

Verification source: Annual report of the Statistical Office of the Republic of Serbia, Eurostat

Since 2012, the number of freshmen enrolling in ICT studies has grown at an average annual rate of 13.9%, which puts the Republic of Serbia in a more comfortable position than the countries of the European Union. This growing trend is a combined consequence of the spontaneous growth of young people's interest in ICT studies and the increase in enrolment capacities. In this situation, while the trend is growing, it is sufficient just to monitor it regularly.

Research shows that as many as 39% of the male population choose to study engineering and informatics, while only 15.5% of women do so. Women's interests are more diverse, which shows the distribution in far more numerous areas: from business and law, through social sciences and journalism, medicine and the arts. Interest in ICT studies is in the last, tenth place.

It turns out that there are no systemic obstacles to the inclusion of women in ICT education and development, so it is sufficient just to monitor this part of the ICT corpus. When considering measures to increase the number of women in this area, they should be sought during the period of growing up. It is desirable to discover the reasons for the reduced interest of women

in this area, which are assumed to be in the earlier stages of education (primary and secondary school), general culture and values.

As regards to the workforce structure of ICT professionals, according to EUROSTAT data for 2018<sup>80</sup>, 84.5% of professionals with ICT education are employed, among whom 27.8% are women. This percentage of women is currently the highest on the EUROSTAT list of countries. 43.3% of young ICT professionals are employed (up to 34 years of age), while 19.1% are women employed as ICT professionals. An indicator that the Republic of Serbia is at the very top in terms of gender equality in the ICT field is the fact that the average annual growth in relation to the number of girls studying in the ICT field in the European Union is 4.1% (for the period 2013-2016), while in Republic of Serbia (for the period 2015-2017) it amounted to an average of 7.4%. The growth of enrolled girls is higher than the growth of enrolled boys, so that the share of the female population is additionally increasing.

Other measures and specific objectives have already addressed the need and opportunities for greater involvement of young people and in particular greater involvement of women in digital skills training. In addition to the above measures of promotion and incentives, it is possible to take measures that would link education and employment programmes. Colleges and universities in the field of ICT, through planned cooperation with the IT industry and the provision of work practice and mentoring, can provide job offers to make it easier for their students to enter the labour market. It is also possible to teach business and entrepreneurial skills so that participants can start their own business, with the mentorship or support of educational institutions themselves or by enabling membership in professional associations and networks.

The measure includes the following activities:

4.2.1 Regular statistical monitoring of the number of newly enrolled and graduated students in the field of ICT;

4.2.2 Increasing enrolment quotas at ICT related faculties;

4.2.3 Stimulating professional and mentoring internship programmes for ICT occupations;

4.2.4 Conducting a sociological survey of the female population at a younger age on (dis) interest in education in the ICT sector with an analysis of results and development of key recommendations;

4.2.5 Promoting greater involvement of young people, in particular girls and girls in the ICT sector (by marking International Girls in ICT Day, etc.).

#### *4.3. Raising research capacities in the field of ICT*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications, Ministry of Education, Science and Technological Development, Office for Information Technologies and E-Government

---

<sup>80</sup> <https://ec.europa.eu/eurostat/data/database>

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of implemented projects in the field of ICT  
Value of ICT projects

Verification source: Publicly available sources

Raising research capacities in information technology is key to developing new and innovative solutions. In Belgrade, in cooperation with the Government, the Ministry of Education, Science and Technological Development, the City of Belgrade and the University of Belgrade, a Science and Technology Park was established, which brings together dozens of high-tech companies/ teams and provides support to start-up companies/ teams and growing high-tech companies in developing and commercialization of innovative products and services. Within the auspices of the Science and Technology Park in Belgrade are the following: Business-Technology Incubator of Technical Faculties (BITF) which implements a support programme for start-up companies/ teams and the Innovation Fund, which provides financial support through the Early Development Programme and other support programmes for innovation development.

In addition to Belgrade, there are science and technology parks in Niš and Novi Sad, and the establishment of a science and technology park in Kragujevac has also been envisaged. Progress has also been achieved in the business incubator segment. After the adoption of the Law on the Science Fund of the Republic of Serbia<sup>81</sup> in 2018, the Science Fund was established the following year. International scientific cooperation in the field of information technologies is especially important for raising scientific research capacities.

The disconnection of science and education with the economy, as well as insufficient investment in research and development, are key internal obstacles to the development of the ICT sector, and in that sense it is essential to establish and improve cooperation between science, education, economy and the state. The key external weakness is the reliance on the import of technologies and related knowledge and the absence of a strategy of “smart research specialization”. Government and other projects for the implementation of which ICT experts are necessary represent an exceptional opportunity to overcome these key barriers and connect science, education, economy and the state. Projects in areas such as health, agriculture, education, sociology, and so-forth, for which it is necessary to include ICT experts, in addition to experts in this field, are of great relevance for the development of ICT skills among non-ICT experts.

The establishment of the Science Fund is a big step in this direction. A smart strategy for choosing project topics and the opportunity for all stakeholders to participate in projects, including faculties, scientific institutions, economic entities and individuals, directly strengthens cooperation between all key actors in the field of ICT. In addition, this approach enables the inclusion of domestic potential, learning through practice or specific work, and is also an opportunity for the exchange of intergenerational and interdisciplinary knowledge, which is invaluable. Steps for active engagement, and thus raising the number and skills of ICT experts,

---

<sup>81</sup>“Official Gazette of the RS”, number 95/18

require the existence of a transparent manner of gaining insight into existing and planned calls for tender participation in projects.

The strategy implies continuous investment in human capital, in order to develop the knowledge economy. The growth of the Serbian software industry shows that knowledge already exists, but the fact that this industry is mostly export-oriented and that most employees are engaged in providing services, namely at workplaces that have little added value, indicates that the use of this knowledge is not optimized. Bearing in mind that the level of development of a company is reflected in the structure of articles exported by that company, the Republic of Serbia shall, if this trend continues, despite the invested funds, effort and time, remain at a low level of added value or technological development.

Investing in the development and advancement of domestic ICT professionals does not have a full effect, if their knowledge cannot be applied and used in the domestic market. Therefore, in order to build a digital economy in the Republic of Serbia, it is necessary to intensify the creation and use of domestic solutions. Creating domestic solutions involves the use of existing ICT experts, which also preserves existing staff and prevents it from transferring to the global digital market, given that this type of staff has globally sought after and valorised skills. Since the state is the bearer of development both due to the volume of work and the budget, engaging domestic labour force and solutions on specific projects in the public sector is the best investment into educational, research and innovation capacities.

The measure includes the following activities:

4.3.1 Establishment of a portal with a list of ICT related projects (which include the engagement of ICT experts) and regular publication of new projects and calls for tenders;

4.3.2 Involvement of the best students in ICT projects of general public interest;

4.3.3 Organizing competitions for the best solutions and innovations on the topic of current needs of digitalization in the Republic of Serbia (for example, platforms for acquiring digital skills);

4.3.4 Involvement of the economy in scientific research development through thematic projects in the field of ICT.

#### *4.4 Improving the skills of ICT professionals and promoting lifelong learning*

Measure type: Informative and educational measure

Institutions responsible for the implementation of the measure: The Ministry of Trade, Tourism and Telecommunications and the Ministry of Education, Science and Technological Development

Coordinator for the implementation of the measure: Ministry of Trade, Tourism and Telecommunications

Measure level result indicator: Number of companies that provided training to their ICT experts to develop and upgrade skills

Verification source: Eurostat, publicly available sources

Rapid progress in the field of ICT requires monitoring of training curricula and their regular updating. Knowledge updating can be carried out in various ways - formally, through existing educational institutions that would offer appropriate training, through informal providers of (accredited) training, with employers and their associations, via the Internet and so-forth. Employers in the ICT sector can also provide special incentives for their employees to constantly develop digital skills, which is necessary in modern conditions also due to the possible dislocation of jobs, automation and other technologies that replace jobs.

In order to permanently improve the skills of existing and future ICT professionals, as well as their number, it is necessary to include an interdisciplinary approach and all forms of education: formal, non-formal and informal. The idea that the formal education system should follow developments is basically good and accurate, but only at the level of harmonizing existing educational programmes with the current and changing approach to education. The formal education system is a massive and complex structure. Changes are needed, but quick and frequent developments are harder to achieve. Formal education should provide fundamental knowledge, fundamental principles, approaches and ways of thinking. Non-formal education, in turn, is an easier, faster, better and, ultimately, far cheaper way to acquire current knowledge. Cooperation between formal education and business requires a necessary effort to bridge the gap between education and training, on the one hand, and labour market needs and demands, on the other. The most effective way to bridge this gap is through non-formal education. Investments and initiatives can derive from the economy, from the labour market, from interest groups and/or professional associations, from specific projects and so-forth.

A strategically significant element for the advancement and further development of ICT professionals from the aspect of education should aim at increasing (including) interdisciplinarity, namely, connecting ICT with other areas, such as health, agriculture, sociology, politics, law, economics, tourism, mining, etc. The interdisciplinary approach should include intergenerational and cross-sectoral knowledge transfer, which is characterized both by tradition and knowledge from new industries. As the Serbian economy is dominated by traditional industry, this approach is of special importance for its further development along with the use of digital technologies.

The nature of work in the on-line sphere defines the required digital skills. However, working in the digital sphere carries its own responsibility for personal and professional development. This means that a worker in this sphere is responsible for knowing the demand on the market and how to respond to it. Of course, this requires both continuous monitoring of trends and learning. Lack of understanding and ignorance of the necessary need for self-initiative and active engagement in terms of learning, specialization and business improvement can be a major obstacle to the development of ICT professionals and ICT skills in general. For its part, the on-line sphere, in addition to jobs, provides the opportunity to follow trends and improve through non-formal education.

Unlike the hitherto known social character of work, work in the digital sphere is characterized by autonomy, atomization and mobility. Such properties of work enable hidden

employment, i.e. for the system an invisible corpus of people acquiring informal digital knowledge. It should be borne in mind that this informal knowledge can be transposed into a visible zone through certification.

The measure includes the following activities:

4.4.1. Continuous revision of the list of elective subjects and/ or elective courses at ICT related higher education institutions, in accordance with the development of technologies and market needs;

4.4.2 Introduction of courses/ subjects into study programmes that require participation in specific (mini) projects and are implemented on the proposal and in cooperation with interested companies;

4.4.3 Promoting the introduction of elective ICT courses in accordance with the needs of the profession at higher education institutions that are not within the ICT field (agriculture, medicine, law, economics, and so-forth);

4.4.4 Promotion of benefits for ensuring lifelong learning of ICT professionals by employers, academic and other scientific research organizations;

4.4.5 Researching students' attitudes on the topic of proposing new subjects/ courses (student conferences).

4.4.6. Development and implementation of a programme of continuous specialized training of ICT experts in public administration.

## **6. KEY PERFORMANCE INDICATORS**

Measuring progress in the field of improving the digital skills of citizens is a basic performance indicator of the entire Strategy. Namely, the achieved results in terms of the scope of computer literacy among citizens must be regularly reviewed, in order to gain insight into the progress achieved and create further activities and accessible content, but also to include as many residents as possible.

A good basis for reviewing the results achieved at the national level are certainly surveys conducted by the Statistical Office of the Republic of Serbia on an annual basis. However, in order to be able to respond to specific needs in a particular area, it is necessary to involve other actors, such as: local self-government units that have an important role in collecting data related to the territories of those local self-governments; educational institutions that should monitor and report on the number of enrolled pupils and students according to individual educational profiles; the National Employment Service that keeps records and reports on training for the unemployed and employers; employers' associations and employers themselves who conduct employee

training, whereby it is crucial to statistically monitor data from the civil sector and training providers through reports and so-forth.

Data collected should be disaggregated by age, gender, disability and other characteristics that define the target population, including data obtained through individual assessments of the training courses themselves. It is also possible to consider opportunities of aggregate use of automatically generated data concerning the use of digital platforms and services as a way of mapping patterns of digital competencies and skills, in particular in view of e-services. Based on the collected data, it is vital to evaluate the data in terms of not only the number and characteristics of the population, but also the coverage of digital skills, updating of training courses, adjustments in terms of needs, and so-forth.

Key performance indicators of general and specific objectives shall be elaborated in detail within action plans. The first action plan for the implementation of the Strategy will be adopted for the period 2020-2021, within 90 days from the date of adoption of the Strategy. Based on the evaluation of the implementation of this action plan, a second action plan for the period 2022-2024 shall be prepared.

## **7. INSTITUTIONAL FRAMEWORK AND IMPLEMENTATION MONITORING PLAN**

The implementation of the Strategy is monitored by the Ministry of Trade, Tourism and Telecommunications, which leads and coordinates the process of implementation of the Strategy at the national level.

The ministry responsible for trade, tourism and telecommunications, the ministry responsible for education and science, the ministry responsible for labour and social policy and the Ministry responsible for public administration, local self-government and local self-government units, the National Academy for Public Administration and other institutions are liable for implementing the Strategy within the framework of envisaged measures and activities:

Educational institutions play a key role as they provide ways to acquire knowledge for a wide percentage of the population. This includes representation at all levels of education, including primary and secondary schools, technical and vocational institutions, vocational schools and universities.

As regards the private sector, the concept is to ensure that digital skills plans meet the needs of the workforce and the plans of companies to apply technology, but also involve this sector in planning. The international private sector, and in particular mobile operators, are also becoming increasingly involved in efforts to achieve digital and mobile literacy as they have recognized such a need.

Training providers include: employers, technical and vocational schools, NGOs and other programmes, as well as workshops. Employers have always played a key role in workforce training through direct employment, on-the-job training, and internship programmes.

Civil society: The engagement of civil society is of equal importance. Civil society organizations representing the interests of ethnic minorities, persons with disabilities, youth, women and other target or marginalized groups can ensure that digital skills planning meets the needs of these populations.

Non-formal digital skills training providers: non-formal training providers, technology clubs, centres, and so-forth. - All of them can provide information and advice as guidelines for the development of digital skills training programmes and can play a key role in their implementation.

The Ministry of Trade, Tourism and Telecommunications, after the end of the third calendar year from the day of adoption, shall prepare a report on the results of implementing the Strategy and submit it to the Government for their information. After the implementation of the Strategy, the Ministry of Trade, Tourism and Telecommunications will prepare a final report on the results of implementing the Strategy and lodge it with the Government no later than six months after the expiration of its application.

## **8. FINANCIAL EFFECTS OF THE STRATEGY**

Funds necessary for the implementation of measures and activities planned by this strategy, the implementation of which shall contribute to the achievement of defined strategic goals, will be provided through the budget of the Republic of Serbia in accordance with balance possibilities, while additional funds shall be provided from donations, projects, international aid, as well as other sources, according to the needs.

## **9. FINAL PART**

The strategy must be published on the Government's website, on the e-Government portal and on the website of the Ministry of Trade, Tourism and Telecommunications, within seven working days from the date of the Strategy's adoption.

This strategy must be published in the "Official Gazette of the Republic of Serbia".

05 Number: 090-1516/2020  
In Belgrade, 27 February 2020

**G O V E R N M E N T**

**PRIME MINISTER**

Ana Brnabić