KNOWLEDGE IN THE INFORMATION SOCIETY: NEW SKILLS FOR THE DIGITAL ECONOMY

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Abstract

Technological progress is a driver of new skills. Over the past twenty years, many innovations have begun to be massively used, and the Internet has become a global phenomenon. The working environment is changing, and many activities become digital. Globally, networked computers are introduced into education, health and administration systems. The digital literate population is one of the main conditions that must be met for the digital society to operate successfully. Digital literacy represents one of the eight key competences for lifelong learning and development in a modern, global, information and digitised society. In this chapter, we describe digital literacy in the light of the development of the concept, with the focus on the latest research. We also present the definitions of digital literacy as a multidimensional and multilayer concept. These definitions often change by the advancement of technology. We point to the problem of measuring digital literacy and show the largest research results in this field. We have shown the digital compartment framework that the European Union is developing through the DigComp project. The part of this chapter is a preview of the digital competence framework developed by the European Union through the DigComp project. Finally, we stressed that Serbia is also aware of the process of digitisation and its importance to the economy and society. Unfortunately, the available data show that the level of digital literacy in Serbia is below the European average.

Keywords: Digital literacy, Digital skills, Digital competences, DigComp, Digital Skills Indicator, European Union, Serbia

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INTRODUCTION

Digital transformation encompasses numerous opportunities for the development of society and economics, but it also entails numerous challenges. The progress of technology has left many people behind, so it is important to set the focus on raising the capacity of human resources and especially in the labour contingency segment. Most countries, regardless of the level of social and economic development, are making efforts to build these capacities. This process strengthens the link between policy-makers, the education sector, the academic community and the business sector, who are recognised as key stakeholders. It is also important to emphasise that the impact of digitisation is global and requires the active involvement of all stakeholders.

The US association "The Partnership for 21st Century Skills" (P21's) is one of the world's leading organisations that focuses on creating partnerships and strong cooperation between leading education institutions, government leaders and business representatives. P21's goal is to support the process of providing the necessary skills to students that will enable them to integrate into society and the labour market successfully. The P21's recognised the most important areas of education - „language (English), reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics" (Partnership for 21st Century Skills, 2008). In addition to these areas, various types of literacy are also covered - Financial, Economic, Business, Entrepreneurial, Civic, Health and Environmental Literacy (*Ibid*). The general educational framework should provide students with a creative way of thinking and the ability to solve problems, to communicate and to cooperate. A special focus is placed on the knowledge and skills that are necessary for the era of digitisation, flood of information and great influence of the media. Students are expected to develop information, media and ICT literacy during the educational process. Finally, to be successful in all spheres of life, it is also necessary to develop the Life Skills that include flexibility, adaptability, the skills of social inclusion, the development of personal productivity, leadership and the like.

In this chapter, the focus is on digital literacy analysis, which has a wider meaning than the notion of ICT literacy. Digital literacy represents one of the eight key competences for lifelong learning and development in a modern, global, information and digitised society. The absence of digital literacy is becoming an increasing barrier in the process of social integration and personal development and is viewed at the same level as the physical approach to modern technology as the source of the second-level digital divide (Van Dijk, 2017).

The main aim of this chapter is to present state of the art in this field and to raise questions about further development and systematic research of digital literacy and skills in Serbia.

This chapter is divided into four main sections. In the first section, we offer an overview of digital literacy definitions from the first steps until today. The second section contains the analysis of digital literacy measures constructed by leading international organisations and challenges in the process of development of an internationally accepted digital literacy index. EU framework for Digital Skills and related indicators are presented in the third section, while the content of forth section refers to the situation in Serbia – policies and the level of digital skills measured by values available on Eurostat.

DEFINING DIGITAL LITERACY

As a result of rapid technological development, different forms of literacy transform and become dependent on the context and moment in which they are used. Technology changes the nature of literacy, its meaning, so that it no longer reduces to basic alphanumeric skills and knowledge (reading, writing and computing), but is defined as the competence for speaking and listening, understanding of codes, numbers, characters, animations and various types symbols, including audio and video formats. The first inconsistency with which the reader faces is that the term digital literacy is once used in digital literacy, and sometimes in the plural digital literacies (Kuzmanović, 2017). Then, to describe the skills necessary for learning in the digital environment, in addition to term digital literacy and digital competence, the following

terms are used: ICT literacy, information literacy, digital and internet skills, etc. The basic reason for the conceptual dilemma lies in the fact that digital literacy can be viewed as „an umbrella framework for a number of complex and integrated sub-disciplines" (Covello, 2010).

The first definition of digital literacy appeared in the literature in 1997 and considered that a person is digitally literate has the ability to understand and use the information presented via a computer regardless of the format or source (Glister,1997). With the development of technology there has also been a modification of the digital literacy concept, and in 2004 more specific capabilities were identified (finding, evaluating, sharing and creating content using information and communication technology and the Internet) (Wilhelm, 2004). Van Deursen &Van Dijk (2008) continued to develop the concept and proposed four skill segments: operational skills, formal skills, information skills, and strategic skills, while UNESCO anticipated six competencies: accessing, managing, evaluating, integrating, creating, and communicating information. Bearing in mind the fact that the concept of digital literacy is complex and disagreeable, with a lot of overlapping, Covello (2010) systematised various forms of (digital) literacy and presented them in Table 1. It should be taken into account that the meaning of the term digital literacy changes over time due to a rapid change in technology. Ten or fifteen years ago a large number of capabilities provided by today's technology were not in mass use (live chats, social networks, etc.).

Table 1: Sub-Disciplines of Digital Literacy

Sub-Discipline	Definition
Information Literacy	Finding and locating sources, analyzing and synthesizing the material, evaluating the credibility of the source, using and citing ethically and legally, focusing topics and formulating research questions in an accurate, effective, and efficient manner.
Computer Literacy	An understanding of how to use computers and application software for practical purposes.
Media Literacy	A series of communication competencies, including the ability to access, analyze, evaluate and communicate information in a variety of forms including print and non-print messages.
Communication Literacy	Learners must be able to communicate effectively as individuals and work collaboratively in groups, using publishing technologies (word processor, database, spreadsheet, drawing tools...), the Internet, as well as other electronic and telecommunication tools.
Visual Literacy	The ability to 'read,' interpret, and understand information presented in pictorial or graphic images; the ability to turn information of all types into pictures, graphics, or forms that help communicate the information; a group of competencies that allows humans to discriminate and interpret the visible action, objects, and/or symbols, natural or constructed, that they encounter in the environment.
Technology Literacy	Computer skills and the ability to use computers and other technology to improve learning, productivity, and performance.

Source: Covello, 2010, pp. 4.

Chetty et al. (2017) emphasise that a multidisciplinary approach to defining digital literacy is necessary, since the separation of only technical dimensions, related knowledge and skills for the technical use of software and hardware, excludes cognitive and ethical awareness. The consequences of this failure can be extremely bad. Users with certain technical skills, without cognitive and ethical, is at high risk or poses a potential threat. On the contrary, a person with no developed cognitive abilities can make a decision based on the information it has received on a website with unreliable content or can reveal its identity to an unmanaged participant on the social network. On the other hand, a person without developed ethical skills can misuse its knowledge, for example, to realise a hacker attack. Driven by this subject Covelo (2010) presented the relationship between technological, cognitive and ethical skills in Figure 1.

Figure 1: Intersecting Areas of Digital Literacy
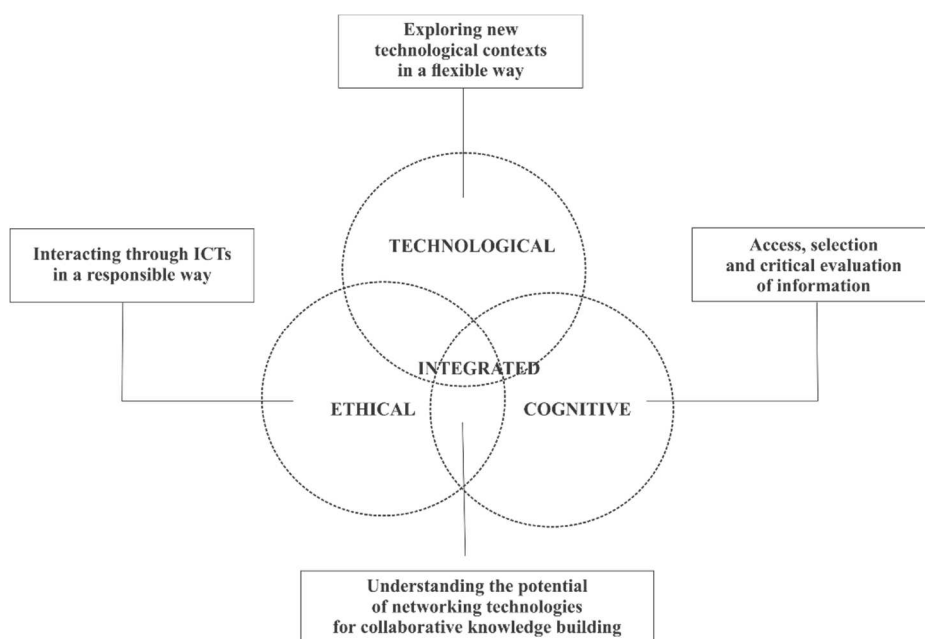
Source: *Covello, 2010, pp. 4.*

Leading international organisations, aware of the importance and the impact of digitisation, publish reports on digital skills, literacy and competencies. The most important definitions are presented in Table 2. The proliferation and massive use of the Internet have led to the fact that in the second decade of the 21st century, some researchers observe digital skills equated to internet skills, because "*Internet skills form a key part of digital inclusion*" (Van Deursen & Hesper, 2014).

In 2006, the European Union recognised Digital Competence as "one of the eight key competencies for Lifelong Learning" (Ferrari, 2013). Digital Competence has special significance because it is seen as transversal competence - the development of this complement enables the development of other competencies.

Table 2: Digital skills definition proposed by the leading international organisations

Sub-Discipline	Definition
EU digital agenda	"Digital literacy is a set of knowledge, skills, attitudes, abilities, strategies and awareness (learning domains) needed in the use of information and communication technology and digital media (tools) for performing various tasks, problem solving, communication, information management, collaboration, creation and sharing content and constructing knowledge (competence areas), in an effective, effective, adequate way, critical, creative, autonomous, flexible, ethical and reflexive (modes); at work, at leisure, for participation in society, learning, socializing (goals)" (Ferrari, 2013).
G20	"Digital literacy is multidimensional phenomenon: information literacy, computer literacy, media literacy, communication literacy and technology literacy that predominantly refer to a heterogeneous set of skills in line with three perspectives - Cognitive, Technical and Ethical" (Chetty, et al., 2017).
OECD	"Increasing use of digital technologies at work is raising the demand for new skills along three lines: generic ICT skills to access information online or use software, ICT specialist skills to programme, develop applications and manage networks and ICT-complementary skills, e.g.: the capability to process complex information, communicate with co-workers and clients, solve problems, plan in advance and adjust quickly" (OECD, 2016).
UNESCO	"Digital literacy is the ability to define, access, manage, integrate, communicate, evaluate and create information safely and appropriately through digital technologies and networked devices for participation in economic and social life. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy, data literacy and media literacy" (UNESCO, 2018).

Carretero et al. (2017) in the latest DigComp report follow the previous approach and observe digital competence through five dimensions:

Dimension 1: Domains or areas of digital competence (5 areas);

Dimension 2: Competencies within the field (in details);

Dimension 3: Levels of achievement for each competence (eight proficiency levels for each of the 21 competences);

Dimension 4: Examples of knowledge, skills and attitudes for each competence and

Dimension 5: Examples of the application of digital competence in different areas (e.g. learning, work, leisure, etc.).

Digital competences in details are presented in Figure 2.

Figure 2: The framework of Digital Competences
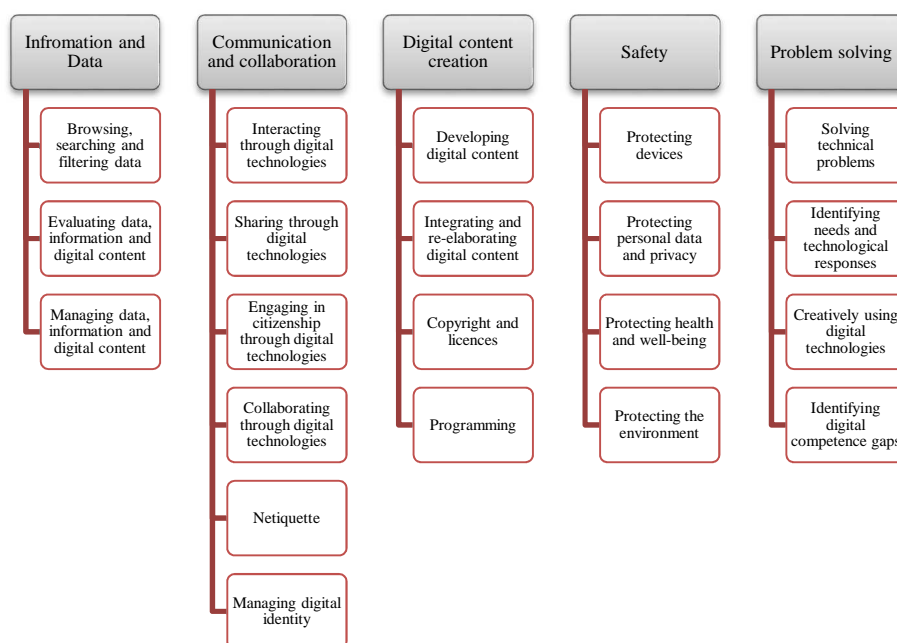
Source: Adapted from Carretero et al. (2017)

After setting up the digital literacy framework, it is necessary to present the measures that have been developed for monitoring the level of digital literacy over time or to allow comparisons between countries.

DIGITAL LITERACY MEASURE(S) – ACHIEVEMENTS AND CHALLENGES

Regardless of the last fifteen years of intense research in the field of digital literacy, skills and competencies, no universal measure has been. In front of G20 countries, Chetty et al. (2017) emphasise that it is necessary to provide adequate support to policymakers in the field of digital literacy – "internationally accepted digital literacy index". This index would allow policymakers to position their country in relation to others and thus make decisions that would improve the situation if needed. Until 2016 Ainley et al. (2016) found four cross-country assessments of digital and ICT literacy skills, presented in Table 3.

Table 3: Cross-country assessments of digital and ICT literacy skills

IEA International Computer and Literacy Study (ICILS)
The ICILS is a study of education systems in 21 countries in computer and information literacy (CIL). It focused on variations in computer and information literacy between and within countries and student and school factors that were related to those variations (Fraillon, et al., 2013). It was delivered using USB drives that contained all required software resources and could be run on school computers. In ICILS students completed a computer-based test of CIL that consisted of questions and tasks that were presented in four 30-minute modules. Each student completed two modules that were randomly allocated from the set of four so that the total assessment time for each student was one hour3. Each module consisted of a set of tasks based on a theme and following a linear narrative structure, and consisted of a series of small discrete tasks followed by a large task. The four modules were: After School Exercise; Band Competition; Breathing and School Trip.
Assessment and Teaching of 21st Century Skills
Assessment and Teaching of 21st Century Skills is a project that sought to define the capacities that needed to be developed so that people progressing through school would be better prepared for life in modern society. After an extensive process of reviews and consultations with experts it developed assessments in two areas that involve digital technology. The construct "learning in digital networks" was seen as comprising four strands: Functioning as a consumer in networks; Functioning as a producer in networks; Participating in the development of social capital through networks; and Participating in intellectual capital (i.e., collective intelligence) in networks.
Programme for International Student Assessment (PISA): Digital Reading
As part of the 2009 cycle of the Programme for International Student Assessment (PISA) sub-samples (36,500 students from 3277 schools) of the national samples of 15-year-old students in 19 countries answered additional questions via computer to assess their capacity to read digital texts. The construct called "digital reading" referred reading in a digital medium rather than being simply a computer-delivered assessment of print reading. It was argued that digital texts included dynamic windows and frames, hyperlinks and networks, multimedia and augmented reality and provided for engaging with on line discussion and social networks. The assessment involved 29 digital reading tasks (38 score points) organised in three 20-minute clusters with each student completing two of these clusters. The digital reading tasks were organised in terms of: text characteristics (familiarity, complexity, vocabulary); complexity of navigation (scrolling, visiting several pages, use of hyperlinks or menus); explicitness of task demands (directions, terminology, constructing responses); and the nature of the response (inferences, evaluations, abstractness).
Programme for International Assessment of Adult Competencies (PIAAC)
The OECD Programme for the International Assessment of Adult Competencies (PIAACC) provides internationally comparable measures of three sets of skills: literacy, numeracy, and problem solving in technology rich environments (PSTRE). It provides national estimates for people aged 16 to 65 as well as relationships with a range of characteristics. According to the PIAAC technical report, the focus of the assessment was not on computer skills but on the cognitive skills required to access and make use of computer-based information to solve problems. The construct aimed to encompass more than the purely instrumental skills related to the knowledge and use of digital technologies. The report of PIAAC provides examples of tasks at three levels of complexity and difficulty.

Source: adapted from Ainley, Schulz and Fraillon (2016)

In spite the fact that there is no universal measure of digital literacy, in the previous period there was a lot of research [3, 4, 6, 9, 10, 11, 12] that contributed to this phenomenon. In most research digital literacy is viewed from two perspectives, as an independent variable, explanatory variable for

the level of some complex skills or as the dependent variable of age, level of education, employment status, work position or else.

The main problem regarding the measurement is the sampling. If researchers use large survey [9, 10, 16], the sample is representative, but the assessment is based on self-reported answers which could be biased (Ainley, 2016). A better method of sampling is the testing of respondents, but the sample is non-representative, the process has high costs regarding time, equipment and money (in most cases respondents are paid, 20€, 40$) [9, 10, 16] and in some cases, it should consider as an experiment (Eshet-Alkali, Amichai-Hamburger, 2004). We hope that further research will resolve this issues.

DIGITAL SKILLS INDICATORS - EU FRAMEWORK

The European Commission has launched the Digital Single Market initiative, with the aim to build an inclusive digital society. The initiative includes building and improving the functionality of Smart Cities, eGovernemet, eHeath and Digital Skills. Digital Skills and Jobs Coalition was also formed by EC, focusing on digital skills - level and disadvantages. For monitoring progress in digitalisation of Member States, EC uses DESI (Digital Economy and Society Index) for each country. DESI is a key performance indicator (composite index) with six dimensions: Connectivity, Human Capital / Digital Skills, Use of Internet Services by citizens, Integration of Digital Technology by business, Digital Public Services and Research and Development in ICT (European Commission, 2018). As a parallel process, EC established the Information Society survey, in 2002 to monitor the development of individuals and enterprises in the ICT area. The formal regulation supporting the survey was adopted in 2004 (No. 808/2004). The main goal was to develop a methodology for monitoring the i2010 strategy, as support for "Digital Agenda for Europe" (Eurostat, 2016). During this process, EC selected more than a hundred indicators to cover key dimensions of the information society in Europe. Following this methodology, Eurostat repeated survey "ICT Usage in households and by individuals" each year, in period 2003-2017 and based on these data, DG

CONNECT and the Eurostat Information Society Working Group created digital skills indicators (Table 4). For this chapter, we will put the focus on comprehensive Digital skills indicators for all individuals and internet users. This indicator is complex and contains four sub-indicators, according to four dimensions, information skills (Digital Skills – Information domain and Basic or above basic Digital Skills – Information domain); communication skills (Digital Skills – Communication domain and Basic or above basic Digital Skills – Communication domain); problem-solving skills (Digital Skills – Problem-solving domain and Basic or above basic Digital Skills – Problem-solving domain) and software for content manipulation skills (Digital Skills – Software for content manipulation and Basic or above basic Digital Skills – Software for content manipulation).

**Table 4: Digital skills indicators developed by Eurostat**

Indicator	Time coverage	Source
Individuals who have written a computer program using a specialized programming language	2003 - 2017	Individuals' level of computer skills
Workers who judge their current ICT skills insufficient for changing job within a year	20114-2011	Individuals' level of computer skills
Digital skills indicator (internet users) - pilot 2012/2014	2012-2014	Individuals' level of digital skills
Individuals with basic or above basic digital skills - pilot 2012/2014	2012-2014	Individuals' level of digital skills
Digital Skills Indicator (internet users)	2015-2017	Individuals' level of digital skills
Digital Skills Indicator (all individuals)	2015-2017	Individuals' level of digital skills
Individuals with basic or above basic digital skills	2015-2017	Individuals' level of digital skills
Digital Skills - Information domain	2015-2017	Individuals' level of digital skills
Basic or above basic Digital Skills - Information domain	2015-2017	Individuals' level of digital skills

Indicator	Time coverage	Source
Digital Skills - Communication domain	2015-2017	Individuals' level of digital skills
Basic or above basic Digital Skills - Communication domain	2015-2017	Individuals' level of digital skills
Digital Skills - Problem solving domain	2015-2017	Individuals' level of digital skills
Basic or above basic Digital Skills - Problem-solving domain	2015-2017	Individuals' level of digital skills
Digital Skills - Software for content manipulation	2015-2017	Individuals' level of digital skills
Basic or above basic Digital Skills - Software for content manipulation	2015-2017	Individuals' level of digital skills

Source: EC. Digital Agenda key indicators. Accessed July 17, 2018.

EC publishes value for Digital Skills indicator at "Digital Agenda Scoreboard key indicators" web page (EC, 2018). It offers the possibilities for analysis of one indicator and comparison two or more countries, analysis of one indicator and comparison breakdowns, to see the evolution of an indicator and compare breakdowns, to see country profiles, ranking table, maps, to compare two indicators (with bubbles sized) and to compare the evolution of two indicators. In the case of Digital Skills indicators, most options are not useful at this moment, having in mind a short timeframe. As an illustration, at Figure 3. we present Digital Skills indicator for all individuals at a basic level in 2017 in the form of map and evolution of a Digital Skills indicator for all individuals at above basic level for all EU member states during the observed period – 2016 and 2017 at Figure 4.

**Figure 3: Map visualisation of Digital Skills indicator of
EU member states for 2017**

Source: https://digital-agenda-data.eu/charts/maps-by-country
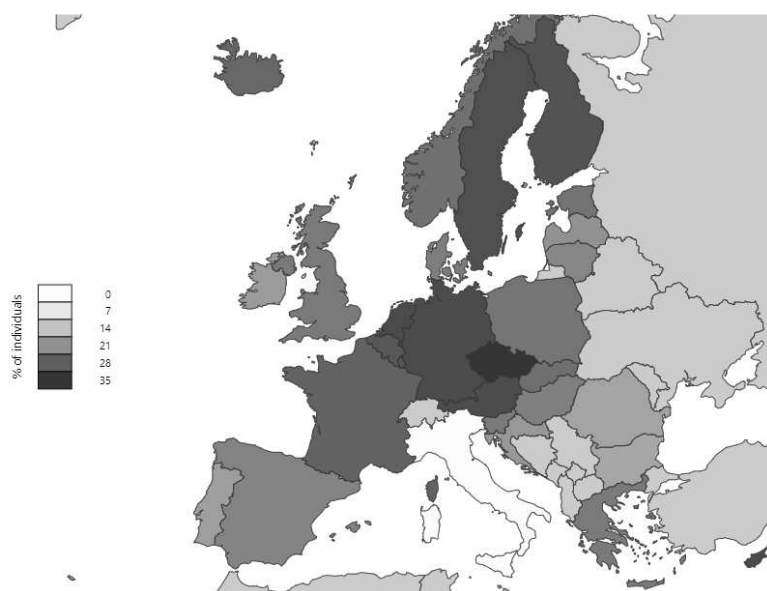
**Figure 4: Evolution of Digital Skills indicator at above basic level of
EU member states in the period 2016-2017**

Source: https://digital-agenda-data.eu/charts/see-the-evolution-of-an-indicator-and-compare-
countries
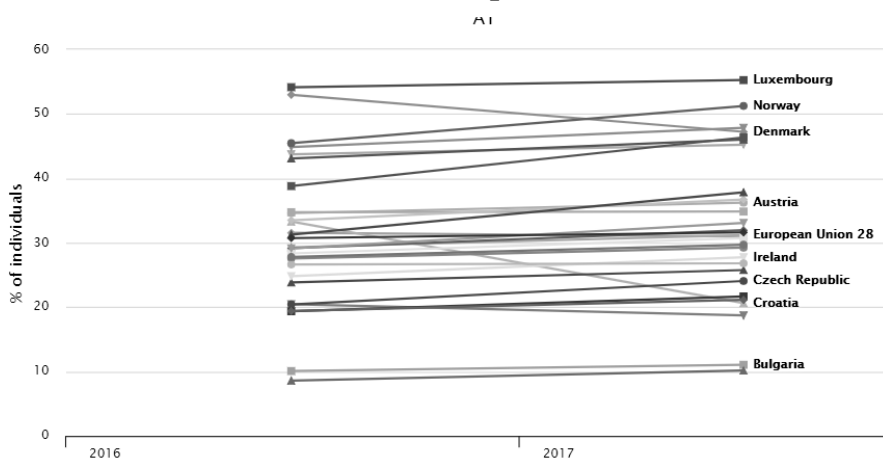
During the last decade, EC has made a great effort to respond to the changing conditions of life and business that arise as a result of the accelerated and comprehensive digitisation of society. Digital Skills indicator and row datasets are extremely useful for policymakers, the scientific community and business sector.

DIGITAL LITERACY IN SERBIA

Serbia is also aware of the significance of the digitalisation and its impact on the society and economy (Bradić-Martinović & Banović, 2018). In our country, similar to other Southeast European countries, the process of integration into the EU has opened the possibility of fundamental changes in the development of public policies and strategies in the field media and information literacy, especially in the media and education sector. Many interested social actors are involved in these processes: ministries in charge of education, media, culture, civil society organisations, business sector, as well as representatives of the international community such as the EU, OSCE, USAID, UNESCO, etc. Mitrović (2017) argues that the positive characteristic of Serbia, regarding the institutional and legal framework, is the adoption of the Law on Telecommunications and other digital services that are compliant with EU regulations. Based on that legislation population in Serbia is able to accept new information and communication technology easily and spontaneously. He considers that Serbia is among moderate innovators with under average results in comparison to EU-28 countries. The weaknesses are the insufficient investment in research and development made by business sector (Pavlović, 2017), poor connections between enterprises and scientific institutes and universities, underdeveloped entrepreneurship, as well as unspecified laws for the protection of intellectual property. Despite that, in the preceding ten years, policymakers are making efforts to increase the ability of the population to use digital technology. Nevertheless, the results of their activities are not sufficiently transparent, and it is difficult to conclude whether the actions carried out have improved digital literacy or not and to what extent. The most important public policies that are or were dedicated to the concept of digital literacy

are: Strategy for the development of the public information system in the Republic of Serbia until 2016; Strategy for Education Development in Serbia 2020; Guidelines for improving the role of information and communication technology in education (2013); and Information Society Development Strategy in the Republic of Serbia until 2020.

Addition to policy, one of the most important initiative is the main deliverable of GOPA's Consultants and the European Association for the Education of Adults (EAEA) project "Second Chance". The project aimed to establish "a system of functional elementary adult education in Serbia, which is accessible and adaptable to the needs of adult learners, focused on life skills and competencies and based upon lifelong learning" (Adult Education Society, 2010). Aleksić et al. (2013) as follow up, publish "Basic Adult Educational Standard – Digital Literacy".

Serbia is lack of scientific research which would provide solid base for evidence-based policy and the most comprehensive work in the field of measuring of digital literacy is the doctoral thesis of Kuzmanović D. entitled "Empirical Validation of Digital Literacy Construct and Analysis of Predictors of Achievements" from 2017 (Kuzmanović, 2017) and proved in the broader context by Ognjenović (2018).

The relative position of Serbia in this field can be observed by Eurostat Digital Skills indicators, having in mind that the Statistical Office of the Republic of Serbia has a harmonised methodology for collecting the survey "ICT Usage in households and by individuals" in period 2007-2017. Eurostat database contains data for Serbia and Table 5 contains available results for some indicators.

Based on the presented results we can conclude that Serbia is lagging behind EU, even though the number of individuals without digital skills is decreasing, while the number of individual with above basic digital skills is increasing. Eurostat database contains presented data, but these data are not available at "Digital Agenda Scoreboard key indicators". Also, Eurostat does not calculate the value of a comprehensive Digital Skills indicator, and for that reason, Serbian policymakers cannot use benchmark analysis to position our country and to measure the value of their policies.

**Table 5: Individuals who have a certain level of digital skills
in EU-28 and Republic of Serbia (in %)**

Digital skills of all individuals	EUROPEAN UNION - 28		REPUBLIC OF SERBIA	
	2015	2017	2015	2017
No skills	22	17	35	30
Low skills	23	26	33	31
Basic skills	27	26	20	20
Above basic skills	28	31	12	19

Source: Eurostat, http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

CONCLUSION

In many countries, the digitisation process has advanced. Digital literacy has become mandatory in almost every business activity. Therefore, digital literacy is a prerequisite for achieving personal and social goals in the future business plan. Digital literacy is one of the key skills of the 21st century. Despite a great effort, the scientific community and policymakers have not yet solved some very important issues. The most important are:

- There is no universally accepted term - in addition to the term of digital literacy, concepts of digital skills, digital competences, computer skills (partly overcome), ICT literacy, Internet literacy are also used.
- There is no unique definition of digital literacy. Bearing in mind that skills follow the development of technology, once defined term lose its relevance over time.
- There is no universal measure of digital literacy – a global index of digital literacy or skills that would provide comparability between countries.

In response to the listed challenges, the world's leading organisations develop possible solutions. A G20 countries has launched their initiative to create a global digital literacy index; the European Commission has been calculating and publishing Digital Skills indicator for last three years (2015-

2017), while Australian Council for Educational Research gave their prospects for a global measure.

ACKNOWLEDGEMENT

REFERENCES

1. Partnership for 21st Century Skills. 2008. 21st Century Skills, Education & Competences: A Resource and Policy Guide. Tucson.
2. *Ibid*.
3. Van Dijk, J. (2017). "Digital Divide: Impact of Access". In: The International Encyclopedia of Media Effects. Wiley: Thomson Reuters.
4. Kuzmanović, D. (2017) Empirijska provera konstrukta digitalne pismenosti i analiza prediktora postignuća. Unpublished PhD thesis. University of Belgrade, Faculty of Philosophy, Belgrade.
5. Covello, S. (2010). A Review of Digital Literacy Assessment Instruments. IDE-712 Front-End Analysis Research. Analysis for Human Performance Technology Decisions. Syracuse University, School of Education/IDD & E.
6. Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Chen, F. (2017). "Bridging the digital divide: measuring digital literacy". Discussion Paper; No. 2017-69.
7. Glister, P. (1997). *Digital Literacy*. New York: John Wiley & Sons.
8. Wilhelm, A. (2004). Digital Nation: Toward an inclusive information society. Cambridge, MA: MIT Press.
9. Van Deursen, A., Van Dijk, J. (2008). Measuring Digital Skills: Performance tests of operational, formal, information and strategic Internet skills among the Dutch population. *58th Conference of the International Communication Association*, Montreal, Canada.

10. Van Deursen, A., Helsper, E., Eynon, R. (2914). Measuring Digital skills: From Digital Skills to Tangible. Tangible Outcomes project report. Available at: www.oii.ox.ac.uk/research/projects/?id=112.
11. Ferrari, A. (2013). "DigComp 1.0: A Framework for Developing and Understanding Digital Competence in Europe". European Commission.
12. Carretero, S., Vuorikari, R., & Punie, Y. (2017). "DigComp 2.1: The Digital Competence Framework for Citizens – with eight proficiency levels and examples of use". European Commission.
13. UNESCO. (2004). The plurality of literacy and its implications for policies and programs. Paris, France.
14. OECD. (2016). "Skills for a Digital World: Working Party on Measurement and Analysis of the Digital Economy". Background Paper for Ministerial Panel 4.2.
15. UNESCO. (2018). "A global framework of reference on digital literacy skills for indicator 4.4.2: Percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills". Draft report. Global Alliance to Monitor Learning (GAML).
16. Ainley, J., Schulz, W., Fraillon, J. (2016). A Global Measure of Digital and ICT Literacy Skills. Background paper prepared for the 2016 Global Education Monitoring Report. Australian Council for Education and Research.
17. Fraillon, J., Ainley, J., Schulz, W., Freidman, T., Gebhardt, E. (2013). *Preparing for Life in the Digital Age*: The IEA International Computer and Information Literacy Study. International Report: Springer Open.
18. Merritt, K., Smith, D., Di Renzo, J. (2005). An Investigation of Self-reported Computer Literacy: Is it reliable?. *Issues in Information Systems*, Vol. VI, No. 1, pp. 289-295.
19. Eshet-Alkali, Y., Amichai-Hamburger, Y. (2004). Experiments in Digital Literacy. *Cyberpsychology & Behavior*, Vol. 7, No. 4.
20. European Commission. (2018). *Human Capital – Digital Inclusion and Skills*. Digital Economy and Society Index Report.
21. Eurostat. (2016). *Methodological manual for statistics on the Information Society*. The survey year 2016.

22. European Commission. Digital Agenda key indicators. (2018) url: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizatios. Retriveal date: July 18, 2018.
23. Bradić-Martinović, A. Banović, J. (2018). Assessment of Digital Skills in Serbia with Focus on Gender Gap. *Journal of Women's Entrepreneurship and Education*, No. 1/2. pp. 54-67.
24. Mitrović, Đ. (2017). Na putu ka blagostanju 4.0 – Digitalizacija u Srbiji. Izveštaj analize Freidrich Ebert Stiftung. Beograd.
25. EU-UNESCO. (2017). Pripremni dokument o nacionalnim politikama i strategijama medijske i informacione pismenosti (MIP) u Srbiji. Projekat Izgradnja poverenja u medije u Jugoistočnoj Evropi i Turskoj. Available at: http://www.mediaeducationcentre.eu/eng/wp-content/uploads/2017/05/Background-document-on-MIL-in-Serbia.SR_.FINAL_.pdf.
26. Pavlović, D. (2017). The Impact of Human Resource Management of the Work Design Concept in Serbia. *Economic Analysis*. Vol. 50, No. 3-4, pp. 86-92.
27. Adult Education Society. (2010). "Start of "Second Chance" project in Serbia." Available at http://www.aes.rs/en/pocetak-second-chance-projekta-u-srbiji/.
28. Aleksić, V., Zdraković, D., Stanković, D., Stanojević, D., Gomilanović, S. (2013). Opšti standardi postignuća za osnovno obrazovanje odraslih – Priručnik za nastavnike. Zavod za vrednovanje kvaliteta obrazovanja. Beograd.
29. Ognjenović, K. (2018). Training Intentions and Skills Needs in the Private Sector Companies in Serbia. *Journal of Women's Entrepreneurship and Education*. No. 1-2, pp. 68-85.