Manufacturing and Information Society in Serbia: Current Status and Prospects

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Abstract: *In modern science it is generally accepted that ICT (information and communication technologies) are important drivers, which 'enables' technologies that have a broad impact on many sectors of the economy and social life. In this framework, the measuring the level of ICT development, their economic and social impact, and the country's readiness to use them must be of great importance, especially for the estimation of the building of the information society. In the first part of the paper some indicators of the use of ICT technologies in Serbia are presented. Further, we present some data of the ICT sector of Serbian economy (number of employees, share in the GDP, foreign trade and foreign direct investments, as well the number of companies). At the end we present the results of a research (Goloventchik and Zhyrkevich), in which the composite index of the digital transformation was constructed on the basis of nine broad used indicators. In the conclusion we emphasize that the building of information society in Serbia is not yet on the satisfactory level.*

Keywords: *digital economy, information and communication technologies, small European economies, Serbia, households, manufacturing*.

1. Introduction

A few decades ago, the world entered an era called digital, and from that moment on, a new, digital revolution began. Technologies are developing extremely fast, changing not only the economy and economic relations, by forming new activities and professions, but also the whole usual way of life of people. Probably the biggest changes have taken place in the economy - various innovative technologies have brought many innovations to the traditional business, leading it to unrecognizable over time. Among them, the development of the Internet and mobile communications attracts attention, with consequences visible even to non-professionals. Attempts have been made to define the essence of the phenomenon in many terms, and the term "digital economy", introduced by the Canadian economist Don Tapscott, in the book written in 1994 and published the following year, proved to be the most successful [15]. It is an economy based on the use of information computer technologies, as defined by Tapskott. Of course, there are other definitions of the digital economy. Thus, it can be defined in more detail as a system of economic, social and cultural relations based on the use of digital information and communication technologies (ICT). We can freely say that in the modern phase of development of the economy and society as a whole, one of the key, first-class

issues for the whole world is the issue of digitalization, especially the digitalization of the economy.
Serbia is not a member of the European Union, but it has still connected the transformation of its society and economy with it. In 2000, the EU set development goals for its members, called the "Lisbon Strategy", in which, among other things, building a digital society is directly linked to the existence and accessibility of ICT to all members of society, all organizations, in short - society as a whole. The EU's emphasis was on ICT, on improving infrastructure and connections. Serbia has joined those strategic goals. Together with other countries of Southeast Europe at the conference "Telecommunications for Development", 2002 in Belgrade, it accepted and signed the international agreement "e-SEE Agenda for the Development of the Information Society", which became the basic document for the development of the information society in this part of Europe. According to that agreement, Serbia adjusted its next planning and other documents. Nevertheless, it should be said that the strategic directions of development of the economy and society of Serbia are determined in a large number of branch and other documents, which are called "Strategy", as well as in other planning and additional documents. But, surprisingly, there is no generalizing strategy among them, which would indicate general orientations and directions. In such conditions, the main goals, mechanisms and means for their realization are not easy to set and therefore there are problems of coordination of the holders of all these different documents.
Strategic documents related to the digitalization of the economy and society include the Strategy for the Development of the Information Society in the Republic of Serbia until 2020, the Strategy for the Development of Broadband Networks and Services in the Republic of Serbia until 2016, the Strategy for the Development of Information Technologies from 2017 to 2020, and many other documents as well (laws and other). The main goal of the Information Society Development Strategy from 2010 was the development of the information society, aimed at using the potential of information and communication technologies to increase work efficiency, economic growth, higher employment, and improve the quality of life of all Serbian citizens. The strategy envisages the following as an impulse for the development of the information society: 1) open, accessible to all and high-quality Internet; 2) developed e-business, including: e-government, e-commerce, e-justice, e-health and e-education. Since the deadline for the Information Society Development Strategy expired in 2020, the new strategy for the period until 2026 (called the Information Society Development and Information Security Strategy 2021-2026) is under public discussion, and it should soon replace the previous one.

2. Assessment of the Serbian economy digitalization

The problems of assessing the development of the digital transformation of the Serbian economy and society as a whole are complicated, in addition to all the above, by the fact that there is no single definition of this term, although more than a quarter of a century has passed since the first use of the term "digital economy". In connection with the later conception of the Fourth Industrial Revolution, placed in Germany at the CeBIT exhibition (Centrum für Büroautomation, Information Technology and Telecommunications) in Hanover in 2011, one of the key characteristics of the digital economy is the application of information and communication technologies. According to the World Bank, the digital economy in the broadest sense of the word is a system of economic, social and cultural relations based on the use of digital information and communication technologies.
For a decade and a half, the State Statistical Office of Serbia has been conducting regular research on the application of information and communication technologies, both in households and in companies. Let's try to point out some results of these surveys (we will use the survey data for 2014 and 2020). First of all, it should be pointed out that the indicators of digitalization and computerization of the country, business and use by the population, legal and natural persons of ICT in Serbia have been constantly increasing in recent years. We will consider the trends of several basic indicators. We will first show the situation in households, i.e., individual use of ICT, and then in companies.
The first result shows the use of the Internet in households (Fig. 1). Of course, this has an indirect relation to the complex of problems considered here, but still it is one of the necessary preconditions for the

general introduction of modern technologies in the economy and society. Overall, this indicator can be assessed as relatively positive (although 100% Internet use is still far away): only in the last decade has the percentage of households using the Internet at home doubled (from about 40% to over 80%). According to this indicator, Serbia is far ahead of the average of developing countries (46.7%) and is almost equal to developed countries (87.0%) [13]. However, it should be borne in mind that access does not (necessarily) mean the use of the Internet, in fact this share is significantly lower (multi-member families have especially older members who do not use the Internet). In that sense, the public opinion poll conducted by the New Serbian Political Thought 2018 in the Belgrade district (seventeen municipalities) is interesting, which showed that two thirds of the surveyed pensioners "never go online" [19]. Since the Belgrade district is one of the most elite in the country in terms of most economic and status indicators, it follows that the picture of that part of the population in Serbia is even worse.

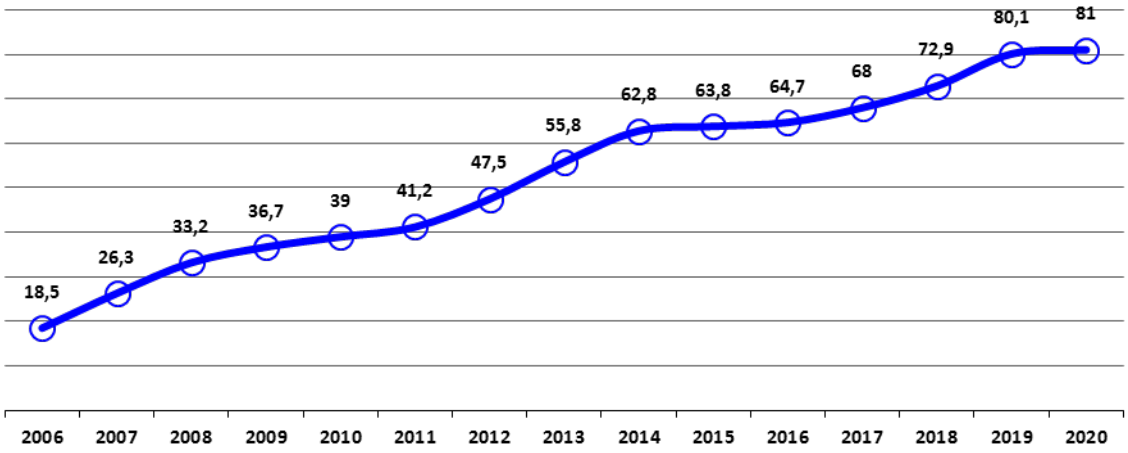

Fig. 1: How many households have internet access (%) [17; 7]

Another result that interests us refers to the individual use of mobile phones (Fig. 2). This indicator is obviously higher, and it is quite close to the amount of 100 percent (only about 6% of Serbian citizens do not use them). Although growth has slowed markedly in recent years, it still seems that there is no need to wait long for the full use of mobile phones.

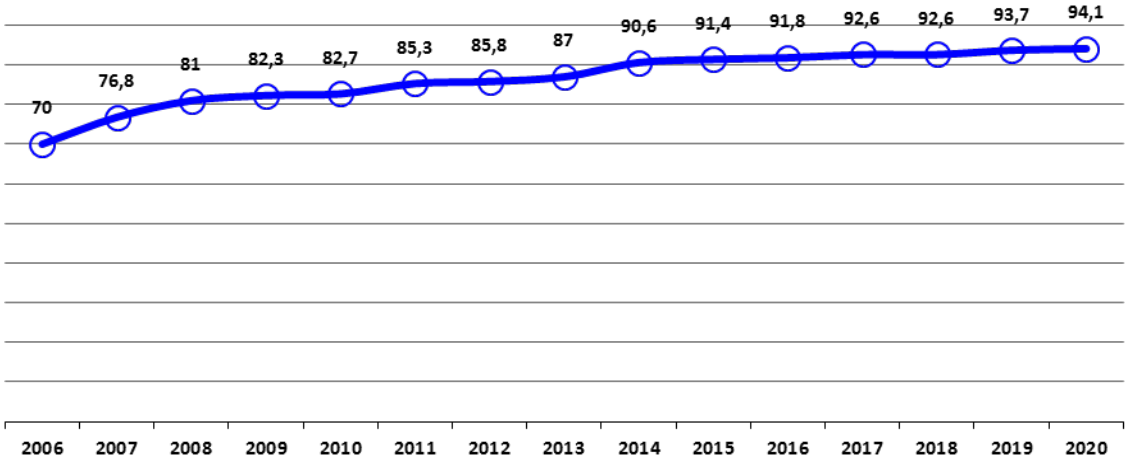

Fig. 2: Individual use of mobile phones (%) [17; 7]

Finally, Figure 3 shows the share of households with a broadband internet connection. Here, too, exceptional growth can be seen in the entire observed period, although it has slowed down somewhat since the middle of the second decade.

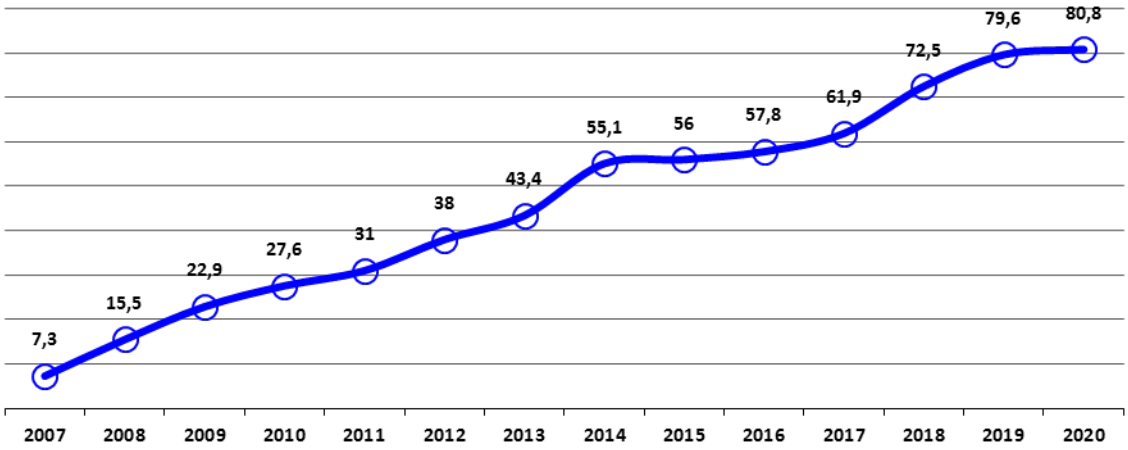

Fig. 3: Broadband internet connection in households (%) [17; 7]

Figure 4 shows the use of the Internet for individual purchases of goods/services (the question is: When was the last time (for private purposes) you bought/ordered goods or services online?). Of course, the time structure of this indicator moves in the desired direction according to the attached scale, but on the whole the value (the number of those who make internet purchases) is significantly lower than the value of the previous indicators. Still, hope is instilled by its steady growth. The structure of products/services procured in this way is dominated by clothing and sports products and sports equipment. Clearly, a special role here is played by customer trust and the legal basis for their protection. This, of course, requires special consideration, for which we now have no space or opportunities.

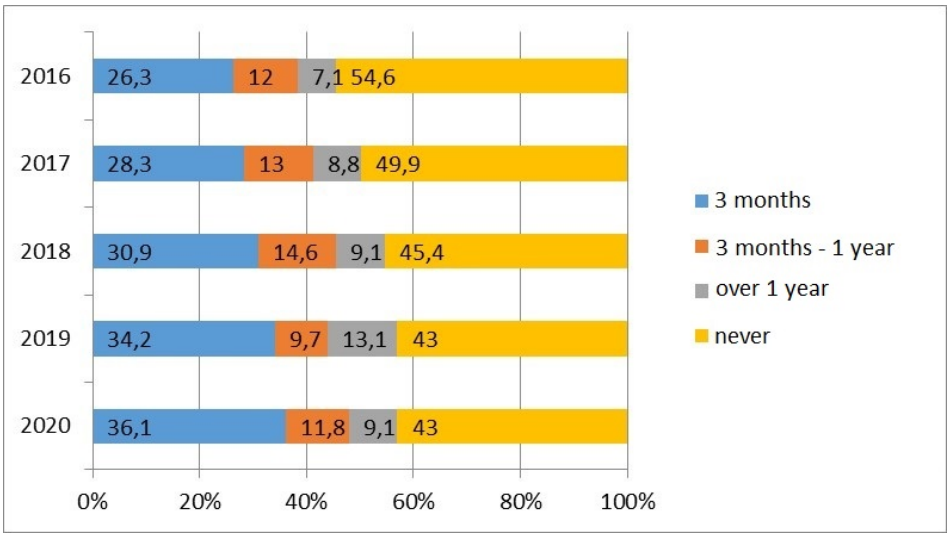

Fig. 4: The interval of the last individual purchase of goods/services via the Internet (%) [17; 7]

Let us now look at the indicators related to the economy. First of all, we emphasize that the research covered a little more than 1500, but that the answers were given by 1270 companies. Of that number, 510 (or just over 40%) belong to the processing industry, so we can say with a lot of confidence that most of the following findings are relevant to it.

At the company level, research has shown the following. The Internet is used by all companies, but of course not all employees. In 2020, 98.4% of companies have a broadband internet connection, which is the level that has been maintained since 2012, with less oscillations. On the other hand, only 19.3% of companies among employees have ICT experts (69.2% of large and 12.1% of small enterprises), which is certainly small, and does not seem encouraging when it comes to overcoming the digital gap compared to the rich and developed countries. Further, about 15% of the companies do not have their own website (Fig. 5), and this can be assessed as unacceptable in modern conditions, since the public is introduced to the company's activities through it, which significantly facilitates its business. However, it should be emphasized that the share of companies that do not have a website is not so large, and more importantly, it has decreased over time. Within the services provided by companies through the website, the description of goods or services, price list (87.6%) and content on the website adapted to regular visitors (72.4%) stand out, while others are significantly less represented, including online ordering or booking of products/services (28.1%) and tracking or status of orders (14.1%).

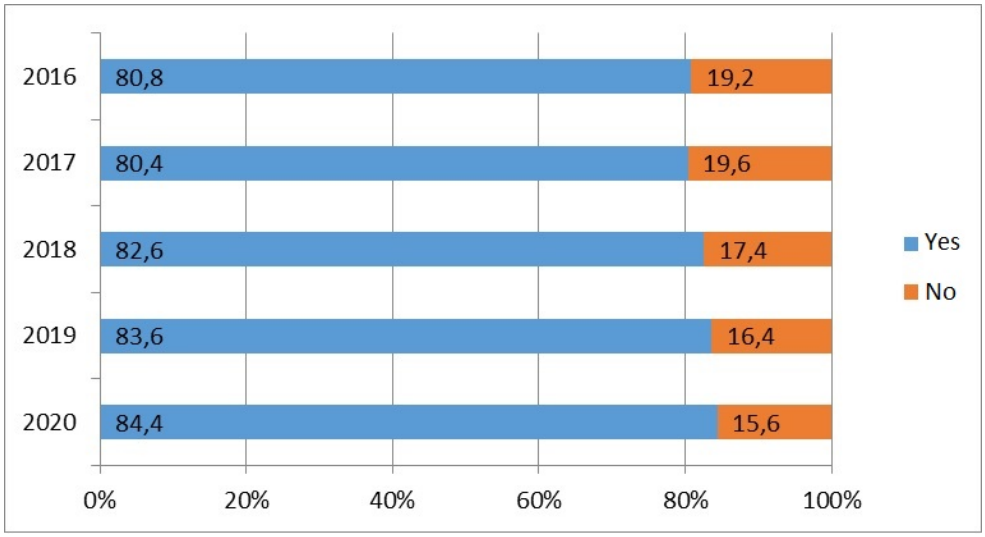

Fig. 5: Share of the company with its website (%) [17; 7]

The following figure (Fig. 6) shows the share of companies that sell their products/services via the Internet. As it can be seen, just over a quarter of companies sell their products/services online, and growth in this area is rather slow. An even more devastating indicator is that only close to 15% of large companies operate online, and the share of medium and small companies is about 30% of all existing ones. We can state that this is quite insufficient for now, and point out the problem of consumer confidence, as one of the probable reasons for this result.

Even clearer than in Figure 4, it is shown here that this aspect of digitalization of the Serbian economy is still at a completely unsatisfactory level. Of course, there is no word on the causes of such a result in this statistical research, and it remains only to speculate about it. In general, it can be assumed that trust in e-commerce is now at a fairly low level. In addition, other results, which are not presented in the figure, should be taken into account. Thus, for example, the structure of companies that sold via the Internet in 2019 is proving defeating: 14.7% of large companies, 30.2% of medium and 28.1% of small ones. In any case, these results must attract the special attention of researchers. An especially important and interesting question is whether there are any other causes of such a bad result, in addition to the mentioned consumer confidence?

On the whole, the results of these researches turn out to be not so bad, although it can be noticed that the achieved assumptions do not correspond to the achieved results. A more detailed analysis could show that there is a particularly strong discrepancy between the generally recognized quality of the workforce, especially young workers, and these results.

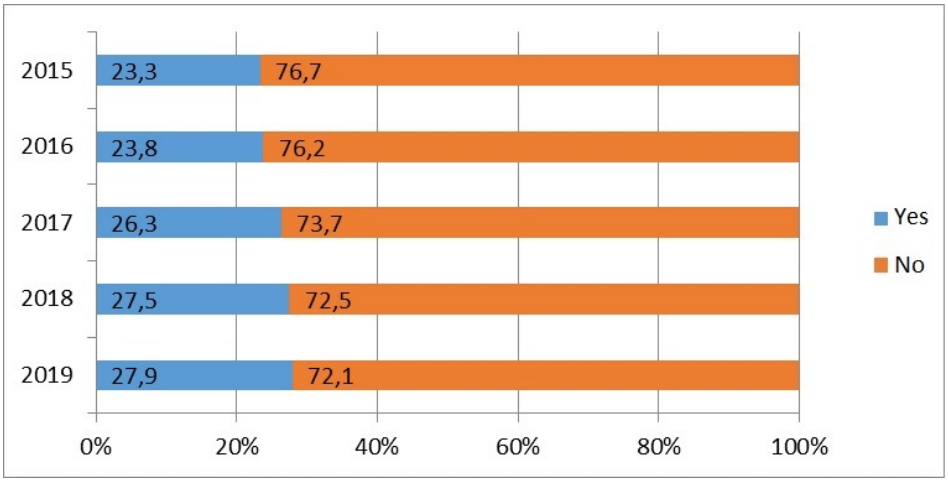

Fig. 6: The share of companies that sold their products/services via the Internet (%) [17; 7]

The second segment of our assessment refers to the results of economic activity in the field of information and communication services and information society (manufacture of computers, electronic and optical products, postal activities, telecommunications, computer programming, consulting and related activities, information service activities and gambling). We will use the available data of the Serbian Chamber of Commerce for the last few years [1;2] and the Strategy Proposal [20]. We will briefly consider the number of employees, wages, foreign trade, foreign direct investment. In the fourth quarter of 2018, 2019 and 2020, only 82.535, 885.44 and 96.662 people were employed in this sphere, which accounted for 4.0, 4.2 and 4.4% of the total number of employees in Serbia (excluding Kosovo and Metohija). The highest average salaries in this activity were realized by employees in computer programming, consulting and related services: in January 2019, 2020 and 2021, their average salaries amounted to 177.861, 199.660 and 240.568 dinars, at the exchange rate of 1€ = 118.0416 (January 2019), 1€ = 117.5643 (January 2020) and 1€ = 117.5820 dinars (January 2021). In the same month in 2020, the export of telecommunications, computer, information and postal services brought revenue of 124.6 million euros, which is an increase of 25.6 percent compared to the same month in 2019, and in January 2021 122.5 million euros (down by 1.7% from January 2020). On the import side, the total value of telecommunication, computer, information and postal services in the same month in 2020 was 43.0 and in 2021 39.3 million euros. In general, a surplus of 81.6 and 83.2 million euros was realized (in January 2020, it increased by 25.7% compared to January 2019, and in January 2021 by 1.9% compared to January 2020). According to [2], in 2019, this activity had a net inflow of foreign direct investments of 212.889 thousand euros, and in 2020, 35.797 thousand. According to the data stated in the Proposal of the Strategy [Proposal of the Strategy for the Development of the Information Society and Information Security 2021–2026], in 2018 there were 2.349 active companies in this sphere in Serbia. Compared to 2011, when the validity of the previous Strategy began, this represents a growth of almost 700 companies. Among these companies, developers predominate (1.483, or 63%), which represent the most dynamic branch of the Serbian economy, with about 200 new companies a year. The Draft Strategy [Draft Strategy for the Development of the Information Society and Information Security 2021–2026] regarding the prospects for the development of this activity concluded that Serbia is a good basis for starting a business in the IT industry, as it has quality workers who can still ensure growth of domestic companies only to a certain level. On the other hand, foreigners come to the Serbian market primarily because of quality IT staff, and they provide all other sources of growth outside Serbia. In general, the ICT sector proved to be the fastest growing in the Serbian economy in the last decade.

In order to obtain a more complete picture of the ICT sector in Serbia, it is of course necessary to consider other aspects. That is why we will turn to the recent research of Belarusian authors who analysed European countries with small economies, to which Serbia also belongs. This brings us to the third aspect of considering the current situation in the ICT sector in Serbia. Thus, the following considerations and assessments are given according to the very current article [12].

Table 1. Ranking of European countries with small economies by level of digitalization development (2017–2019) [12]

Country	IDI 2017	DESI 2019	WDCI 2019	DEI 2017	NRI 2019	EGDI 2018	EPART 2018	GCI 2019	GII 2019
Austria	21	13	20	19	15	20	45	19	21
Albania	89	–	–	–	75	74	59	–	83
Belarus	32	–	–	–	61	38	33	47	72
Belgium	25	9	25	18	20	27	59	20	23
Bulgaria	50	27	45	41	49	47	35	34	40
Bosnia and Herzegovina	83	–	–	–	81	105	125	–	76
Hungary	48	23	43	32	38	45	69	31	33
Greece	38	26	53	38	43	35	34	38	41
Denmark	4	4	4	4	6	1	1	5	7
Ireland	20	6	19	16	19	22	22	18	12
Iceland	1	–	27	–	21	19	75	–	20
Latvia	35	17	36	28	39	57	75	–	34
Lithuania	41	14	30	–	31	40	51	28	38
Luxembourg	9	6	21	–	11	18	19	16	18
Malta	24	10	–	–	26	30	39	–	27
Moldova	59	–	–	–	66	69	37	–	58
Norway	7	–	9	1	4	14	11	8	19
Portugal	44	18	34	24	28	29	30	24	32
Northern Macedonia	69	–	–	–	65	79	71	–	59
Serbia	55	–	–	–	52	49	48	53	57
Slovakia	46	21	47	33	35	49	50	32	37
Slovenia	33	16	32	29	27	37	48	29	31
Finland	22	1	7	5	7	6	1	7	6
Croatia	36	20	51	–	44	55	57	39	44
Montenegro	61	–	–	–	–	58	64	–	45
Czech Republic	43	19	37	27	30	54	92	25	26
Switzerland	3	–	5	3	5	15	41	2	1
Sweden	11	2	3	2	1	5	19	3	2
Estonia	17	8	29	21	23	16	27	21	24

Countries with small economies are determined among all European countries based on the criteria proposed by Professor J.L. Davidenko: the size of the country, as a rule, does not exceed 500.000 km^2, the country's share in world GDP is less than 1%, the country's GDP does not exceed 5% of US GDP, the country's population exceeds 0.5 million, the country's population does not exceed 6% of the USA population, the share of exports exceeds the global average level by 30%. Based on these criteria, Andorra, the Vatican, Cyprus, Liechtenstein, San Marino and Monaco were excluded from the analysis.

The following indicators were used for ranking: ICT development index (IDI) [18]; Digital economy and society index (DESI) [22]; IMD world digital competitiveness index (WDCI) [25]; Digital evolution index (DEI) [8]; Networked readiness index (NRI) [10]; The UN global e-government development index (EGDI) [16]; E-participation index (EPART) [16]; Global connectivity index (GCI, Huawei) [27]; The global innovation index (GII) [11].

These indices have been the subject of analysis in the literature in Serbia as well, although they have been

considered separately. See, for example: [14], where *the Networked Readiness Index (NRI),* proposed by the World Economic Forum, and the position of Serbia in 2014 are analysed in detail. But, attempts to create a general index must be of special interest. Such an attempt was made in the mentioned article, where a general index (average ranking) was constructed for 29 countries with small economies, which was calculated according to the formula

$$N = \frac{\sum_{i=1}^{m}\left(\frac{\ln \cdot n}{\ln(i+1)} \cdot e^{\frac{\Delta i}{n}}\right)}{m}$$

where: i – country rank; n – number of the countries; e – Euler's number; Δi – difference between previous and current rank; m – the total number of ranks in which the country participates in the current year.

Table 2. Rank of European countries with small economies by the level of digitalization development [12]

Rank	Country	Index	Region	Rank	Country	Index	Region
1	Denmark	3,82546	Northern	16	Slovenia	1,31665	Southern
2	Sweden	3,46908	Northern	17	Slovakia	1,31421	Eastern
3	Switzerland	3,32653	Western	18	Hungary	1,31130	Eastern
4	Finland	3,19041	Northern	19	Czech Republic	1,28329	Eastern
5	Norway	2,81022	Northern	20	Lithuania	1,26971	Northern
6	Iceland	2,44225	Northern	21	Moldova	1,26888	Eastern
7	Luxembourg	1,77525	Western	22	Latvia	1,26360	Northern
8	Ireland	1,65771	Western	23	Bulgaria	1,25453	Eastern
9	Estonia	1,50705	Northern	24	Serbia	1,24134	Southern
10	Malta	1,47770	Southern	25	Croatia	1,19811	Southern
11	Austria	1,45211	Western	26	Albania	1,19365	Southern
12	Belgium	1,45144	Western	27	Northern Macedonia	1,19249	Southern
13	Belarus	1,39000	Eastern	28	Montenegro	1,19130	Southern
14	Portugal	1,38529	Southern	29	Bosnia and Herzegovina	1,09628	Southern
15	Greece	1,32998	Southern				

3. Conclusion

Serbia has embarked on the path of building a digital economy and digitalization of society within its pretensions of joining the European Union, after the adoption of the "Lisbon Strategy", in which, among other things, building an information society is directly related to the existence and access to ICT to all organizations, in other words - to the whole society. Many preconditions for equal involvement in upcoming activities and harmonization of the regulatory environment with the EU, of course, were not met, but still the country was a good basis for starting a business in the IT industry, as it had quality workers. However, they can only ensure the growth of domestic companies to a certain level. On the other hand, foreigners started coming to the Serbian market primarily because of quality IT staff, and they provided all other sources of growth outside Serbia. In such conditions, the results achieved have so far proved to be not entirely satisfactory, although certain assumptions for further transformation have been met.

In the latter period, a number of activities have been undertaken to improve Serbia's position in digitalization processes. Let us mention, for example, that the Digital Summit of the Western Balkans was held in Belgrade in April 2019, where guidelines for cooperation on ICT technologies and digitalization in the

region were established, all of which are related to similar processes within the EU. The program for disseminating knowledge in the field of digital transformation "Serbia is digitalizing" is an instrument of cooperation between the Republic of Serbia and partner countries in the field of digital transformation, in order to strengthen the capacity needed to perform professional and technical work to support e-government implementation. The goal of the Program is to establish new and improve existing forms of partnership, based on knowledge exchange and mutual strengthening of capacities needed for digital transformation and support for the development of e-government [28].

In the process of digitalization, Serbia received EU support in certain sectors. Thus, it is emphasized that the European Investment Bank (EIB) will invest 65 million euros in the modernization of primary and secondary schools in Serbia for the introduction of digital equipment and high-speed internet connection, as well as capacity building for the training of 50.000 teachers. In line with Serbia's national education strategy, the investment will improve the digital capacity of schools, and is expected to create up to 700 new jobs. [24]. It should be noted, however, that the current reforms in the field of education (not only in Serbia) are quite controversial. See, for example [21] In addition to this endeavour related to the digitalization of schools, there is a plan to build science and technology centres with the EIB in Belgrade, Nis and Novi Sad that will deal with both advanced technologies and digitalization [26].

In political and media appearances, it is often pointed out that digitalization in Serbia has already given economic results, both in the economy directly and in savings in non-economic areas. Thus, for example, digitalization in e-government in administration, according to the report of the competent government representatives at the World Forum on Digitalization in mid-2021, "has saved about 180 million pages of paper since 2017" [23]. Similar assessments can be found when it comes to combating the gray economy, etc. Of course, such political-propaganda speeches need to be passed through the filter of objective analysis, and we will not deal with them.

On the whole, the presented results can be assessed as modest enough. The country is together with other states that emerged in the territory of SFR Yugoslavia in a not very enviable place. That is why it can be said that Serbia obviously has a long and difficult way to go in order to create a digital economy (and society). We cannot be satisfied with the achieved results as a whole, regardless of the fact that we are at the level of other countries that appeared on the European map after the disintegration of Yugoslavia (with the exception of Slovenia).

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