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PERFORMANCE ASSESSMENT OF THE BALKAN COUNTRIES IN THE INFORMATION AND COMMUNICATION TECHNOLOGIES SECTOR

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Abstract

The rapid technological development of the last decades has affected practically all areas of the economy, society, and culture. Almost every aspect of life and work in the modern world to a greater or lesser extent depend on the use of information and communication technologies (ICT). The aim of this paper is to analyze the ICT performance of ten Balkan countries and to highlight areas that need further improvement. The analysis is based on the data published by the International Telecommunication Union in annual Measuring the Information Society Report. The research is conducted through comparative analysis and benchmarking method. The ten best-positioned European countries in terms of ICT development represent the benchmark group. The analysis finds low level of national ICT performance of the Balkan countries compared to the

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selected European countries. The conclusions of this research may serve as guidelines for ICT policy makers in the observed economies.

Keywords: *ICT performance; ICT development index; Balkan countries; European countries.*

JEL Classification: O33, O36, O57

Introduction

Information and communication technologies (ICT) have transformed the modern society into an "information society", but also the "old economy" into a digital economy. According to the European Commission [2019], 22% of the value of e-commerce is generated by businesses selling their products and services on online platforms; European e-commerce turnover increased by 15% to €530 billion in 2016; while for 2017, European Business-to-Consumer e-commerce turnover was forecast to reach around €602 billion, at an annual growth rate of nearly 14%.

It is difficult to imagine any interaction between people, companies, and public institutions without ICT as a tool for informing, correspondence, and paying. Briefly, ICT have significant role in designing the way of living, learning, working, and playing in the modern society [Wang *et al.*, 2021]. Considering the important role that ITC have in social development, ITC sector is one of the most vital industries and significant factor of economic growth in many countries. This sector provides key contribution to the development and performance of the new economy, and presents an engine of GDP growth, productivity, and competitiveness that characterize numerous economic sectors in all countries across the world [Radu, & Podasca, 2013]. These are the reasons why ICT development should be monitored and improved in each national economy that advocates an open development model.

The level of ICT development varies from region to region, i.e. from country to country. Europe is one of the leaders in the ICT development. According to Horizon 2020 [European Commission, 2017], the ICT sector represents 4.8% of the European economy, it generates 25% of total business expenditure in the field of research and development, while ICT investments produce about 50% of overall productivity growth in Europe. Also, investments in ICT in the European Union (EU) constantly increase. There are estimates in Horizon 2020 that such EU investment will support

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the whole chain from basic research to innovation that can deliver new business breakthroughs, often based on emerging technologies [European Commission, 2017].

Despite the significant treatment of ICT sector in the European economy, European countries are not at the same level of ICT performance. There are great differences of ICT performance between European countries, even within the EU. Greater differences exist between EU countries and other European countries that are not EU members. For instance, it is expected that the level of ICT performance of the majority of Balkan countries that are not EU members be far behind from EU members.

The ambition of this paper is benchmarking of performance factors within the ICT sector in Balkan countries with leading European countries. The purpose is to evaluate the extent to which Balkan countries lag behind the top European countries in terms of ICT performance. Furthermore, the aim is to find the factors that are critical for ICT competitiveness in the Balkan countries, i.e. factors that need a priority of development policy and urgent improvements to cut the gap with the top European destinations in the future. This analysis and its outcomes should give guidance to policy makers in defining development goals and improving critical factors of ICT performance.

The first part of the paper presents the theoretical background and literature review in the field of ICT performance. Research methodology and data basis are defined in the second section of this paper. The research results are presented and discussed in the third section. The last section summarizes the conclusions and recommendations for improving the ICT of the Balkan countries.

Theoretical Background and Literature Review

The emergence and development of ICT have introduced significant changes in the social structure. As an important tool for social and economic development, ICT change the way of business and the manner of conducting business activities. Almost all modern operations require support or use of ICT [Asongu & Odhiambo, 2020; Đorić, 2020; Krstić *et al.*, 2016a; Popović, 2020].

The foundations of economic development of the contemporary world are based on highly developed technology, innovation, and knowledge [Đokić, 2018; Krstić *et al.*, 2016; Petrović-Ranđelović *et al.*, 2018]. These are the reasons because modern theory and practice talk about the "new economy" is based on the technology, information, and knowledge, which takes the place of the "old economy" based on physical factors of production such as labour, capital, and land.

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ICT are the basis of creating a "new economy". The name "new economy" began to be used in the late nineties of the twentieth century, when the US economy achieved economic growth through the use of ICT. Addition to above, theorists use the phrases as digital economy, information economy, and in recent years, it is used the term Internet economy. All terms are related to the impact of ICT on the economy and society. The new way of business based on ICT implies important improvements such as reducing costs, increasing transparency and availability of information, and focusing on innovations and networking [Black & Lynch, 2004].

Considering that ICT permeate almost every aspect of social life, there are a large number of theoretical and empirical studies which evaluate the impact of ICT on various aspects of economic and social state and behaviour of people, companies, and national economies. Consequently, there is a large body of literature that examines the influence of ICT on business operations and firm performances, but also on productivity and competitiveness of national economies.

Most ICT studies have concentrated on analysing the determinants of its adoption [Lehr & Lichtenberg, 1999; Baliamoune-Lutz, 2003; Bayo-Moriones & Lera-López, 2007]. Ollo-López & Aramendía-Muneta [2012] claim that the factors analysed in such studies can be classified into three groups: factors related to the company staff that are going to use ICT, factors related to the characteristics of the company, and factors related to the environment in which the company operates. Alam & Noor [2009] and Lopez-Nicolas & Soto-Acosta [2010] found out that perceived benefits, ICT knowledge and skill, and government support are also important factors of ICT adoption.

Some papers [Ray *et al.*, 2004; Gursoy & Swanger, 2007; Spyros *et al.*, 2011] explore various elements of ICT that are important competitive advantage resources. Breznik [2012] considers that impact of ICT on competitiveness can be either direct or indirect, while Piccoli [2004] and McAfee & Brynjolfsson [2008] observe investment in ICT as a facility to enhance productivity and reduce costs. Mihalič, Praničević & Arnerić [2015] indicates that there are opposite attitudes that support the ICT paradox theory. Researchers from this school of thought argue that there is no significant impact from ICT investments on firms' value, firm performance, and its competitive advantage [Willcocks & Lester, 1999; Carr, 2004; Aral *et al.*, 2006; Lee & Connolly, 2010].

Numerous studies examine the contribution of ICT to economic growth and competitiveness of national economies or certain industries and sectors of national

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economies [Gomez-Barroso & Marban-Flores, 2020; Myovella *et al.*, 2020; Vu *et al.*, 2020]. Kostoska & Mitrevski [2008] estimate the impact of ICT on the competitiveness of the Macedonian economy. Their research findings indicate a low level of ICT development in Macedonia in that period and propose preparing an appropriate policy for technological development aimed with the research and development activities as the main instigator of the new technologies and innovations. Some studies analyse the impact of the ICT on development and competitiveness of the hospitality sector [Siguaw *et al.*, 2000; Ham *et al.*, 2005; Mosleh & Shannak, 2009], tourism industry [Buhalis & Zoge, 2007], and hotel sector [Avcikurt *et al.*, 2011; Mihalič *et al.*, 2015]. The authors of these studies argue that ICT are one of the crucial factors for improving performances and competitiveness of companies, industries, and even the whole economy.

Research Methodology and Data Basis

The purpose of this paper is to analyse ICT performance of Balkan countries as a focus group, but also in European countries as a benchmark group. The analysis of the ICT performance is based on the methodology of the *International Telecommunication Union*. Secondary data published in *Measuring the Information Society Report 2016* represent the information basis for the research. After the 2016 report, the International Telecommunication Union published the 2017 and 2018 (the last-published publication at the time of writing this paper) reports. However, the methodology of index calculation was changed in the 2017 publication. The authors of this paper decided to use the data from 2016 because they believe that the methodology and indicators used in the 2016 report better reflect the state of ICT performance in the countries that do not belong to the group of developed economies (such as most Balkan countries) than in the 2017 and 2018 reports.

The *International Telecommunication Union* (ITU) in its publication *Measuring the Information Society Report 2016* ranks countries according to the development of ICT. For this purpose, ITU uses *ICT Development Index* (IDI), which aggregates quantitative indicators for *ICT access*, *ICT use*, and *ICT skills* in most world economies. This index is designed to be global and to reflect changes taking place in countries at different levels of ICT development [International Telecommunication Union, 2016].

The IDI is a composite index that combines 11 indicators into one benchmark measure, which can be used to monitor and compare ICT development between

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countries and over time. The conceptual framework for measuring IDI is presented in Table no. 1.

Table no. 1. The Conceptual Framework for Measuring IDI: Indicators, Reference Values, and Weights

ICT access	**Reference value**	**Weights of indicator inside of sub-index (%)**	**Weights of sub-index inside of IDI (%)**
1. Fixed-telephone subscriptions per 100 inhabitants	60	20	40
2. Mobile-cellular telephone subscriptions per 100 inhabitants	120	20	
3. International Internet bandwidth (bit/s) per internet user	976,696*	20	
4. Percentage of households with computer	100	20	
5. Percentage of households with Internet access	100	20	
ICT use	**Reference value**	**Weights of indicator inside of sub-index (%)**	**Weights of sub-index inside of IDI (%)**
6. Percentage of individuals using the Internet	100	33	40
7. Fixed (wired)-broadband subscriptions per 100 inhabitants	60	33	
8. Active mobile-broadband subscriptions per 100 inhabitants	100	33	
ICT skills	**Reference value**	**Weights of indicator inside of sub-index (%)**	**Weights of sub-index inside of IDI (%)**
9. Mean years of schooling	15	33	20
10. Secondary gross enrolment ratio	100	33	
11. Tertiary gross enrolment ratio	100	33	

* This corresponds to a log value of 5.99, which was used in the normalization step.
Source: International Telecommunication Union, 2016, p. 9

As it is presented in Table no. 1, the IDI is divided into the three sub-indexes, which are divided into their component indicators.

Access sub-index captures ICT readiness, and includes five infrastructure and access indicators: fixed-telephone subscriptions, mobile-cellular telephone subscriptions,

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international Internet bandwidth per Internet user, households with a computer, and households with Internet access.

Use sub-index captures ICT intensity, and includes three intensity and usage indicators: individuals using the Internet, fixed-broadband subscriptions, and mobile-broadband subscriptions.

Skills sub-index seeks to capture capabilities or skills, which are important for ICT. It includes three proxy indicators: mean years of schooling, gross secondary enrolment, and gross tertiary enrolment. As these are proxy indicators, rather than direct measures of ICT-related skills, the skills sub-index has less weight in the computation of the IDI than the other two sub-indexes [International Telecommunication Union, 2016].

The analysis of ICT competitiveness in this research does not pretend to specify and formulate a unified recommendation for ICT development policy of the Balkan countries. The purpose of this paper is to identify the critical determinants of competitiveness (indicators in the IDI methodology) for each country from the Balkan group. Benchmarking is used to determine the critical indicators as segments of the ICT development policy of Balkan countries in the future period. The following ten Balkan countries are in the focus of research: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, North Macedonia, Montenegro, Romania, Serbia, and Slovenia. Since the study covers ten Balkan countries, the authors define the group of top ten European countries as a benchmarking group: Denmark, France, Germany, Iceland, Luxembourg, Netherlands, Norway, Sweden, Switzerland, and United Kingdom.

Research Results and Discussion

Analysis of Balkan Countries' ICT Competitiveness

The analysis of the ICT competitiveness of Balkan countries is based on data about overall rank and value of the IDI. The ITU [2016] analysed and ranked total 175 countries. Table no. 2 shows the position of the Balkan countries, according to overall rank and value of the IDI. In the first half of the rankings in Table no. 2 are the following Balkan countries: Slovenia (the first place in the group, the 33rd place in the world), Greece (the second in the group, the 36th in the world), Croatia (the third in the group, the 41st place in the world), Bulgaria (the fourth place in the group and the 49th position in the world), and Serbia (the fifth place in the group, the 51st place in the world). The second half of the rankings consists of: Romania

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(the sixth place in the group, the 60th place in the world), Montenegro (the seventh place in the group, the 62nd place in the world), N. Macedonia (the eighth place in the group, the 65th place in the world), Bosnia and Herzegovina (the ninth place in the group, the 80th place in the world), and Albania (the tenth place in the group, the 91st place in the world). Slovenia records the highest value of the IDI among Balkan countries (7.23). The country with the lowest value of the IDI is Albania (4.92).

Table no. 2. The Value and Rank of Balkan Countries According to IDI Sub-indexes (2016)

Country	IDI value (0-10)	IDI overall rank (out of 175)	Rank on the list of isolated group of Balkan countries	Access sub-index value	Use sub-index value	Skills sub-index value
Slovenia	7.23	33	1	7.93	5.71	8.87
Greece	7.13	36	2	7.85	5.46	9.01
Croatia	7.04	41	3	7.58	6.13	7.79
Bulgaria	6.69	49	4	6.86	5.84	8.04
Serbia	6.58	51	5	7.22	5.50	7.48
Romania	6.26	60	6	6.90	5.08	7.37
Montenegro	6.05	62	7	6.85	4.61	7.34
N. Macedonia	5.97	65	8	6.68	5.17	6.13
Bosnia and Herzegovina	5.25	80	9	5.78	4.21	6.27
Albania	4.92	91	10	4.73	3.88	7.36
Average	***6.31***	**-**	**-**	***6.84***	***5.16***	***7.57***

Source: International Telecommunication Union, 2016

The best-placed Balkan country in the world rankings, Slovenia, is located at the 33rd place out of 175 analysed countries, while the weakest positioned Albania lags behind Slovenia by 58 positions, in the 91st place (Table no. 2). Balkan countries, which record a lower value of the IDI compared to the average value of the IDI (6.31), are the following: Romania, Montenegro, N. Macedonia, Bosnia

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and Herzegovina, and Albania. Considering 175 countries analysed by the ITU, with the exception of Albania, all Balkan countries are located in the first half of the world list according to the IDI. For Balkan countries, the average value of Access sub-index is 6.84, Use sub-index 5.16, and Skills sub-index 7.57.

Analysis of Top 10 European Countries' Competitiveness as a Group for Benchmarking

With the aim to analyse the ICT competitiveness of Balkan countries, it is relevant to find the competitive position of the top 10 European countries with the highest value of the IDI. The top 10 European countries are the benchmarking group of countries, which serves for comparison to 10 Balkan countries. Table no. 3 shows the values and ranks according to indicators within IDI.

Europe, with seven countries in the world top 10, continues to dominate the rankings (Table no. 3). Iceland records the highest value of the IDI among 175 countries (8.83), followed by second-ranked Denmark (8.74), and third-ranked Switzerland (8.68). The first three European countries are followed by United Kingdom, Sweden, Netherlands, Norway, Luxembourg, Germany, and France.

The average value of the IDI for top 10 European countries is 8.49. Compared to the Balkan countries, it means a big difference according to the average value of the IDI of Balkan countries (6.31). This leads to the view that Balkan countries lag much behind the top 10 European countries according to IDI value.

Table no. 3 shows very interesting facts about the competitiveness factors and performances of the top 10 European countries according to indicators within the IDI. France and Germany occupy the first and the second place when it comes to the Fixed-telephone subscriptions per 100 inhabitants indicator. The best countries according to Mobile-cellular telephone subscriptions per 100 inhabitants indicator are Luxembourg and Switzerland. From the above-mentioned of top 10 European countries, Luxembourg has the highest ranking in terms of International Internet bandwidth (bit/s) per internet user. When looking at the Percentage of households with computer indicator, Iceland is the first, and Norway and Netherlands are the second and third country in Europe. Luxembourg tops the ranking of Percentage of households with Internet access. Iceland and Luxembourg occupy the first and the second place when it comes to the Percentage of individuals using the Internet indicator. Switzerland and Denmark are the first two European countries according to Fixed (wired)-broadband subscriptions per 100 inhabitants. Sweden and Denmark lead in Europe in Active mobile-broadband subscriptions per 100 inhabitants. Switzerland dominates in Mean years of schooling. Netherlands, Denmark, and

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Sweden occupy top three scores in Secondary gross enrolment ratio. Iceland, Denmark, and Netherlands have recorded three best scores for Tertiary gross enrolment ratio.

Table no. 3. Top 10 European Countries According to Value and Rank of the IDI (2016)

Indicators	Iceland	Denmark	Switzerland	United Kingdom	Sweden	Netherlands	Norway	Luxembourg	Germany	France	Average value for the top 10 European countries
I_1 Fixed-telephone subscriptions per 100 inhabitants	49.94	29.92	50.25	52.65	36.67	41.27	20.02	50.97	54.93	59.91	44.65
I_2 Mobile-cellular telephone subscriptions per 100 inhabitants	114.01	128.34	142.01	125.75	130.38	123.54	113.58	148.51	116.71	102.61	124.54
I_3 International Internet bandwidth (bit/s) per internet user	725,806	328,018	275,957	374,553	421,237	242,326	220,937	7,186,378	117,540	129,973	1,002,273
I_4 Percentage of households with computer	98.50	92.28	88.44	89.90	88.25	96.20	96.47	95.34	90.99	81.55	91.79
I_5 Percentage of households with Internet access	96.55	91.74	84.70	91.25	91.03	95.97	96.60	96.78	90.29	82.62	91.75
I_6 Percentage of individuals using the Internet	98.20	96.33	87.97	92.00	90.61	93.10	96.81	97.33	87.59	84.69	92.46
I_7 Fixed (wired)-broadband subscriptions per 100 inhabitants	36.95	42.51	44.79	37.72	36.07	41.73	38.94	36.48	37.19	41.34	39.37
I_8 Active mobile-broadband subscriptions per 100 inhabitants	93.43	116.80	97.61	87.79	122.09	70.54	92.83	83.33	75.10	74.65	91.42
I_9 Mean years of schooling	10.59	12.73	13.77	13.28	12.27	11.91	12.75	11.71	13.46	11.41	12.39
I_{10} Secondary gross enrollment ratio	111.99	129.78	96.31	124.43	128.46	130.69	113.01	102.42	102.48	110.94	115.05
I_{11} Tertiary gross enrollment ratio	81.36	81.24	56.27	56.87	63.39	77.34	76.12	19.74	61.06	62.15	63.56
IDI value	***8.83***	***8.74***	***8.68***	***8.57***	***8.45***	***8.43***	***8.42***	***8.36***	***8.31***	***8.11***	***8.49***
IDI global rank	***2***	***3***	***4***	***5***	***7***	***8***	***9***	***11***	***12***	***16***	-

Source: International Telecommunication Union, Measuring the Information Society Report 2016

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Table no. 4. The Values of Indicators within the IDI for Balkan Countries (2016)

Indicator	Slovenia	Greece	Croatia	Bulgaria	Serbia	Romania	Montenegro	N. Macedonia	Bosnia and Herzegovina	Albania	The highest value of Balkan countries	Average value of Balkan countries	The highest value of the top 10 European countries	Average value of the top 10 European countries
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I1	36.22*	46.53#	34.70*	23.26	36.47*	19.79	24.85	17.66	20.20	7.09	46.53 Greece	26.67	59.91 France	44.65
I2	113.22	113.98	103.77	129.27#	120.52*	107.14	162.16^{0}	105.38	90.15	106.38	162.16 Montenegro	115.20	148.51 Luxembourg	124.54
I3	154,627*	100,861*	72,381	145,170*	20,478	146,012*	102,166*	53,890	56,331	30,660	154,627 Slovenia	88,258	7,186,378 Luxembourg	1,002,273
I4	77.75*	68.57*	76.78*	59.04	64.42*	68.69*	56.44	68.42*	47.11	25.72	77.75 Slovenia	61.29	98.50 Iceland	91.79
I5	77.64*	68.09*	76.71*	59.14	63.76*	67.71*	61.09	69.38*	53.60	35.47	77.64 Slovenia	63.26	96.78 Luxembourg	91.75
I6	73.10*	66.84*	69.80*	56.66	65.32*	55.76	64.56	70.38*	65.07	63.25	73.10 Slovenia	65.07	98.20 Iceland	92.46
I7	27.63*	30.73*	23.18*	22.41*	16.75	19.77	18.08	17.19	16.62	7.60	30.73 Greece	20.00	44.79 Switzerland	39.37
I8	52.03	45.65	75.42*	81.29*	71.75*	63.53*	43.65	56.19	33.48	40.58	81.29 Bulgaria	56.36	122.09 Sweden	91.42
I9	12.12*	10.54*	11.03*	10.57*	10.82*	10.64*	11.16*	9.26	9.16	9.26	12.12 Slovenia	10.46	13.77 Switzerland	12.39
I10	110.95*	108.20*	98.43*	100.88*	94.34	97.89*	90.34	82.83	89.30	96.43	110.95 Slovenia	96.96	130.69 Netherlands	115.05
I11	85.22^{0}	110.16^{0}	61.63	70.79#	58.05	52.17	55.53	39.35	37.74	62.71	110.16 Greece	63.36	81.36 Iceland	63.56

Source: International Telecommunication Union, Measuring the Information Society Report 2016

Legend:

☐ Indicates that the value is below the average value of Balkan countries.

☐ * Indicates that the value is above the average value of Balkan countries.

☐ # Indicates that the value is above the average value of top 10 European countries.

☐ 0 Indicates that the value is above the value of the best country in the group of top 10 European countries.

Comparative Analysis of ICT Competitiveness Factors within the Balkan Countries

To assess the achievements of Balkan countries in each indicator treated as ICT competitiveness factors, the values of 11 indicators within the IDI [2016] are presented in Table no. 4. The information serves to understand the relative positions of countries according to each indicator compared to the highest value and the

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average value of Balkan countries, as well as the highest value and the average value of the top 10 European countries.

Table no. 4 shows that the average value of almost every IDI indicator of Balkan countries, except Tertiary gross enrolment ratio (I_{11}), lag much behind the average value of IDI indicators of top 10 European countries (see column 13 and 15). Therefore, Balkan countries have many possibilities for improvement of almost all their performances that determine the ICT competitiveness.

Based on the above stated analysis, the list of critical indicators in Balkan countries, that need to be priority in development policies and improvements as soon as possible to reach the average value of the group, can be determined (Table no. 5).

Table no. 5. Indicators within the IDI which Require Improvements and Priority of ICT Development Policy by Balkan Countries (2016)

Country	The critical indicators which show the deviations from the average value of the group of Balkan countries	Number of critical indicators
Slovenia	I_2, I_8	2
Greece	I_2, I_8	2
Croatia	I_2, I_3, I_{11}	3
Bulgaria	I_1, I_4, I_5, I_6	4
Serbia	I_3, I_7, I_{10}, I_{11}	4
Romania	I_1, I_2, I_6, I_7, I_{11}	5
Montenegro	I_1, I_4, I_5, I_6, I_7, I_8, I_{10}, I_{11}	8
N. Macedonia	I_1, I_2, I_3, I_7, I_8, I_9, I_{10}, I_{11}	8
Bosnia and Herzegovina	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11}	11
Albania	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11}	11

The total number of deviations below the average value of the IDI (observed by indicators) shows that the worst positioned countries are Bosnia and Herzegovina and Albania with 11 critical indicators. Montenegro and N. Macedonia has 8 critical indicators. Romania has 5 critical indicators. Bulgaria and Serbia show deviations in 4 critical indicators. Croatia has 3 critical indicators, while Slovenia and Greece have poorer performances in 2 critical indicators of IDI. All of these countries must necessarily make many efforts to make improvements that bring them closer to the average value of the Balkan countries.

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It is important to identify the indicators in which most Balkan countries record a deviation. The Mobile-cellular telephone subscriptions per 100 inhabitants (I_2) and the Tertiary gross enrolment ratio (I_{11}) indicators require intervention and improvement by the majority of countries in the analysed group of Balkan countries (7 from 10 countries) (Table no. 5).

The urgent actions for improving the values of Fixed-telephone subscriptions per 100 inhabitants (I_1), Fixed (wired)-broadband subscriptions per 100 inhabitants (I_7), and Active mobile-broadband subscriptions per 100 inhabitants (I_8) indicators are necessary in six Balkan countries. The International Internet bandwidth (bit/s) per internet user (I_3), Percentage of individuals using the Internet (I_6), and Secondary gross enrolment ratio (I_{10}) indicators are problematic and need corrective action in five Balkan countries. Four Balkan countries have to improve initiatives in the case of Percentage of households with computer (I_4) and Percentage of households with Internet access (I_5) indicators. The Mean years of schooling (I_9) indicator requires improvement in three Balkan countries.

Benchmarking of ICT Competitiveness of Balkan Countries in Relation to the Top 10 European Countries

The aim of this research segment is to show and analyse critical indicators of IDI of Balkan countries. Problematic indicators, according to their performances, need the priority of policy makers in Balkan countries. In order to determine the critical indicators, it is necessary to perform the comparison of the average value of the indicators (1 to 11) for the Balkan group of countries and the group of top 10 European countries.

Balkan countries achieved worse performances than top 10 European countries in all 11 indicators of IDI. The biggest gaps between the average values of the top 10 European countries and Balkan countries are in the following indicators (Table no. 4): International Internet bandwidth (bit/s) per internet user (I_3), Fixed (wired)-broadband subscriptions per 100 inhabitants (I_7), Fixed-telephone subscriptions per 100 inhabitants (I_1), Active mobile-broadband subscriptions per 100 inhabitants (I_8), Percentage of households with computer (I_4), Percentage of households with Internet access (I_5), and Percentage of individuals using the Internet (I_6). These indicators are priority areas for the Balkan countries to improve performances and achieve a better place in the ranking list.

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Smaller difference is achieved in the following indicators: Secondary gross enrolment ratio (I_{10}), Mean years of schooling (I_9), and Mobile-cellular telephone subscriptions per 100 inhabitants (I_2). Balkan countries lag at least when it comes to Tertiary gross enrolment ratio (I_{11}) indicator.

However, some Balkan countries exceed the average of the top 10 European countries in some indicators (Table 4). Greece achieved better result than the top 10 European countries in Fixed-telephone subscriptions per 100 inhabitants (I_1) indicator. The France result in this indicator (59.91) may serve as a benchmark standard for Greece in the following period. Bulgaria exceeds the average of the top 10 European countries in Mobile-cellular telephone subscriptions per 100 inhabitants (I_2) and Tertiary gross enrolment ratio (I_{11}) indicators. Therefore, Bulgaria can use the Luxembourg result in the Mobile-cellular telephone subscriptions per 100 inhabitants indicator (148.51) and Iceland result in the Tertiary gross enrolment ratio indicator (81.36) as a target, i.e. benchmark value in the ICT development policy.

Analysis of the indicators shows that all Balkan countries deviate from the average value of the top 10 European countries in the following indicators: International Internet bandwidth (bit/s) per internet user (I_3), Percentage of households with computer (I_4), Percentage of households with Internet access (I_5), Percentage of individuals using the Internet (I_6), Fixed (wired)-broadband subscriptions per 100 inhabitants (I_7), Active mobile-broadband subscriptions per 100 inhabitants (I_8), Mean years of schooling (I_9), and Secondary gross enrolment ratio (I_{10}) (Table 4). When it comes to Fixed-telephone subscriptions per 100 inhabitants (I_1) indicator, nine Balkan countries lag behind the average score of the top 10 European countries. According to Mobile-cellular telephone subscriptions per 100 inhabitants (I_2) indicator, eight Balkan countries have a lower average score than the average score of top 10 European countries. Seven Balkan countries lag behind the average score of the top 10 European countries in Tertiary gross enrolment ratio (I_{11}) indicator. The purpose of this benchmarking is to find benchmark standards for the Balkan countries, which are relevant to guiding and defining development goals in the ICT. Benchmark standards are target levels that each country can set in the ICT development strategy.

Based on the earlier analysis, a certain observations can be specified about the priorities in development policy for each country from the Balkan group. The criteria are based on the urgency or time priority. Firstly, Balkan countries should improve indicators in which deviate from the average value of the Balkan

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countries. When they meet that, the aim should be the average value of the top 10 European countries. After reaching that value, Balkan countries could set a higher goal – the level of performance of the best countries in the group of top 10 European countries. Systematization of indicators is given in Table no. 6.

Table no. 6. Specification of Indicators within the IDI According to Priority and Urgency of Their Necessary Improvement by the Balkan Countries

Country	The first level priority of indicators – the benchmark is the average of Balkan countries	The second level priority of indicators - the benchmark is the average of top 10 European countries	The third level priority of indicators - the benchmark is the best country among top 10 European countries
Slovenia	I_2, I_8	I_1, I_3, I_4, I_5, I_6, I_7, I_9, I_{10}	-
Greece	I_2, I_8	I_3, I_4, I_5, I_6, I_7, I_9, I_{10}	I_1
Croatia	I_2, I_3, I_{11}	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11}	-
Bulgaria	I_1, I_4, I_5, I_6	I_3, I_7, I_8, I_9, I_{10}	I_2, I_{11}
Serbia	I_3, I_7, I_{10}, I_{11}	I_1, I_2, I_4, I_5, I_6, I_8, I_9	-
Romania	I_1, I_2, I_6, I_7, I_{11}	I_3, I_4, I_5, I_8, I_9, I_{10}	-
Montenegro	I_1, I_4, I_5, I_6, I_7, I_8, I_{10}, I_{11}	I_3, I_9	-
N. Macedonia	I_1, I_2, I_3, I_7, I_8, I_9, I_{10}, I_{11}	I_4, I_5, I_6	-
Bosnia and Herzegovina	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11}	-	-
Albania	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11}	-	-

The specification of the indicators shown in Table no. 6 gives guidance in defining priorities into ICT development strategy, i.e. the priorities for indicators improvement as determinants of their competitiveness. The authors found that Bosnia and Herzegovina and Albania have all 11 critical indicators in the first level priority of indicators.

It is important to emphasize that above research findings and identification of ICT competitiveness determinants, obtained by using the benchmarking method, will not meet its purpose if it is not used for further in-depth analysis of the factors within the indicators. For one country, the value of each indicator depends on the real values of the numerous factors within that indicator. Consequently, formulating

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national strategies for improving the ICT competitiveness in Balkan countries is not possible without concentrating on the precise setting the target level of factors within each indicator. By applying this approach, benchmarking can, in a more correct and detailed way, show all critical factors of ICT competitiveness. This step can be performed by calculating the volume of negative (problematic) deviation in the value of each factor within the indicator [Krstić *et al.*, 2016b]. The identified critical deviations from benchmark standard require improvement actions, and direct the policy makers in Balkan countries to define the right goals. In the future period, each country should make efforts to achieving determined goals in order to improve the competitive value and rank on both the European and the world list.

Conclusion

This paper has attempted to provide a review of the current state and development potential of ICT sector in Balkan countries. Results of benchmarking method that is applied in the research point out the competitive factors (indicators) that need to be improved by Balkan countries and indicate the priority of its improving. Factors such as International Internet bandwidth, Fixed (wired)-broadband subscriptions, Fixed-telephone subscriptions, Active mobile-broadband subscriptions, Percentage of households with computer, Percentage of households with Internet access, and Percentage of individuals using the Internet are priority areas for improvement in Balkan countries to get a better place in Europe.

However, some Balkan countries reached better competitiveness level than the top 10 European countries in terms of Fixed-telephone subscriptions (Greece); Mobile-cellular telephone subscriptions and Tertiary gross enrolment ratio indicators (Bulgaria). Furthermore, some Balkan countries exceed the higher value of the IDI than the top European country in Mobile-cellular telephone subscriptions (Montenegro) and Tertiary gross enrolment ratio indicators (Slovenia and Greece).

Nevertheless, Balkan countries achieved worse performances than top 10 European countries in all 11 indicators of IDI, measured by average value. The worst ranked countries in the Balkans are Bosnia and Herzegovina and Albania with all 11 critical indicators in the first level priority for development. Also, some Balkan countries, in case of competitiveness of some indicators, do not reach the average score of the Balkan group, so in the future, their ICT development policy, strategies and national action plans should focus on these factors of competitiveness. After achieving improvements in such factors, Balkan countries

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should strive to advance the indicators, which should reach the average of the top 10 European countries.

The limitations of this study arise from the weakness of the IDI methodology. However, this methodology provides a solid starting framework for the analysis of ICT competitiveness. Using the benchmarking method at the ICT level, sub-indexes/indicators within the IDI, and, especially, at the level of indicators within each of IDI indicators, every Balkan country can identify the guidelines for defining future strategy of ICT development.

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