

# CONTEMPORARY TENDENCIES IN MONITORING THE READINESS OF COUNTRIES FOR THE APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE POST-COVID PERIOD

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**Abstract:** *Monitoring the readiness of countries for the application of information and communication technologies (ICT) has a long tradition. It is reflected through the application of various synthetic indicators - indexes, which were created for these purposes by various organizations and associations. These indicators are expected to reflect new trends in the field of ICT, and also to measure the readiness and achievements of individual countries in the ICT usage. The aim of this paper is to show significant changes in the structure of one of the most well-known indices in this area - Network Readiness Index, which has been in use for almost two decades. The paper emphasizes the application of this index in monitoring the process of digital transformation at the level of economic and social development of individual countries, especially in the COVID crisis. Also, the tendencies of this process in the post-COVID period are considered. Monitoring the process of digital transformation at the country level is characterized by a multidimensional approach. In this sense, the complex structure of the NRI latest version is presented. It is based on 60 indicators grouped in four areas: technological trends, human resources capacity, government regulations and the impact of new technologies on the economy, quality of life and achieving the United Nations Sustainable Development Goals adopted in 2015. Also, the paper discusses the position of Serbia and other*

*Western Balkans countries measured in the context of the newly created index, and presents a comparison of these countries with European Union countries.*

**Key words:** *Information and communication technologies, Network Readiness Index, digital transformation, COVID crisis, Serbia, Western Balkans countries*

## 1. INTRODUCTION

In the literature and practice, we find several approaches and indicators that are used to assess the level of individual countries results in the use of information and communication technologies (ICT) to achieve socio-economic development. These indicators are expected to, on the one hand, reflect new trends in the field of ICT, and on the other hand, to measure the readiness and achievements of individual countries in the application of these technologies. In recent years, there has been an extremely dynamic development and application of ICT in all spheres of economic and social life. In addition to SMAC technologies (social networks, mobile apps, analytics, cloud computing), we also list technologies related to phenomena, such as: big data, Internet of Things-IoT, Internet of Everything-IoE, virtual reality, artificial intelligence systems, all-present computing, application of smart devices, realization of the concept of smart offices,

buildings, cities, etc. Therefore, the need to use adequate tools (adapted to modern technological trends) to monitor all these changes and their impact on the development of society has inevitably arisen. In addition to ICT changes, modern concepts of monitoring the readiness of countries for the application of ICT also take into account indicators in the relation technology-society, i.e. they place special emphasis on the social context of the application of ICT. This especially refers to the impact of ICT on improving the general quality of life of members of society, on trust and security in the use of ICT, as well as on the contribution of these technologies to the realization of the goals of sustainable development of national economies and society.

To the previous changes should be added the significant changes that occurred in 2020 during the COVID crisis, when there was a massive usage of a variety of applications and tools for digital connections and remote work. We are witnesses that during the COVID pandemic, many business activities are focused on online functioning and tele-working, such as activities in the field of financial sector, retail, education, culture, media, entertainment, public services and others (tele-working, tele-conferencing, tele-medicine, distance learning, e-commerce, online public services, etc.).

All of the above has resulted in the change of many existing business models and the creation of new ones, which in most cases have had an impact on the process of digital transformation at the level of business systems and national economies.

In this paper, we will present the most important indicators - indices, which are used to monitor the readiness of countries to implement ICT at the national level. The main emphasis will be on the Network Readiness Index - NRI index, which has a very long tradition of application. We will look at the changes that have taken place in the structure of this index in response to these ICT and social changes. In that sense, we will look at the revised NRI model, which appeared in 2019, as well as the corrections of this model in 2020. In particular, we will consider how this NRI model fits into the "new reality" caused by the COVID pandemic. In the post-COVID period, NRI methodology is expected to be able to track all changes in the digital world, to recognize all-present computing and to reflect the position of each country in the networked world.

The following chapters stand out in the structure of this paper: after the introductory part, the second part presents the well-known indicators for monitoring ICT use by country, and the third part presents a detailed structure of the NRI index - redesigned 2019 model and 2020 correction. The

fourth part of the paper summarizes the new concept of NRI index and digital transformation, especially having in mind the circumstances of the COVID pandemic. The fifth part of the paper is dedicated to the profile of Serbia within the NRI index concept in 2020. The last part of the paper consists of concluding remarks.

## 2. NETWORK READINESS INDEX AND OTHER INDICATORS

The history of calculating and applying the NRI index is almost two decades long. Namely, this index has been in use since 2002. Initially, the NRI index was prepared each year by the World Economic Forum (WEF) in cooperation with the World Bank, then in cooperation with the INSEAD Business School, and later in cooperation with INSEAD and Cornell University. The structure of this index was relatively stable for many years, and in 2019 there were significant changes, which were presented in the annual report (NRI 2019 Report). This report presents an "innovated framework for the NRI index, which represents the factors, policies and institutions necessary for the full coverage of information and communication technologies important for inclusive and sustainable growth, competitiveness and general well-being" [7, p. 20].

In addition to the NRI index, other indicators are used to monitor the use of ICT by country. The most famous among them are:

**The Digital Economy and Society Index (DESI)** proposed by the European Commission, which can be defined as follows: *The Digital Economy and Society Index - DESI is a composite index that summarizes relevant indicators of Europe's digital achievements and monitors the evolution of EU member states in terms of digital competitiveness* [7].

**The ICT Development Index (IDI)** is an index established by the United Nations International Telecommunication Union (UN ITU). This index *"has been published annually since 2009 and is a composite measure that combines 11 indicators in the form of a single indicator. It is used to monitor and compare developments in the field of information and communication technologies between countries and in the time domain."* [8].

**The Digitization Index (DiGiX)** was proposed by the BBVA Research Group. This index *"assesses the factors, behavior of agents and institutions that enable the country to fully apply information and communication technologies in order to increase competitiveness and well-being."* [1, p. 2].

### 3. STRUCTURE AND CONCEPTUAL FRAMEWORK OF THE NRI INDEX

The first version of the NRI index was developed by a group of IT enthusiasts at the Center for International Development at Harvard University in 2002 (Korkman et al. 2002).

This version included indicators related to network infrastructure, competitiveness in the ICT sector, the level of education and the level of ICT implementation in the business sector and public services. Since 2002, every year, under the auspices of the World Economic Forum (WEF), an NRI report has been published, which monitors ICT changes and shows the different achievements of individual countries from all continents.

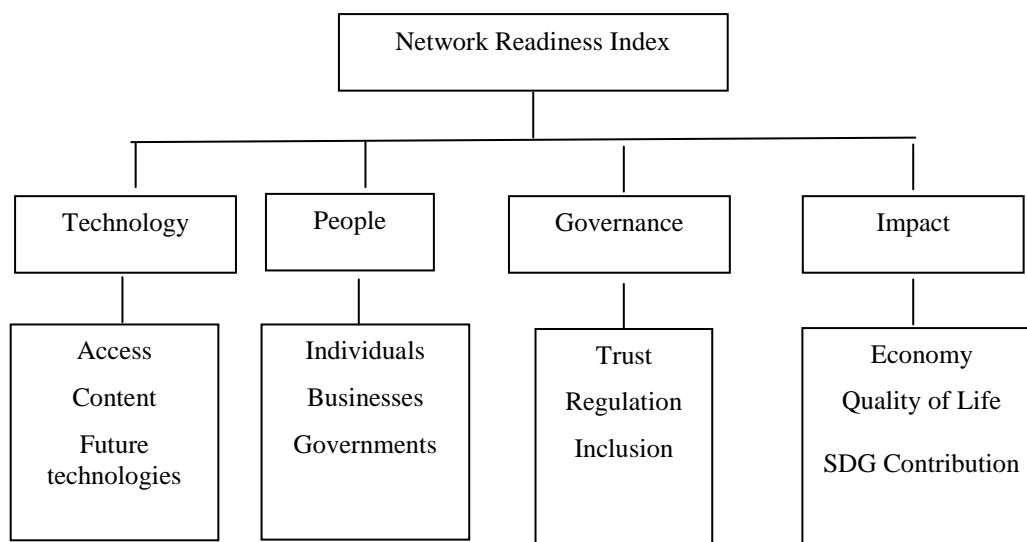
The structure of this index has been relatively stable for many years.

Due to significant changes in the domain of information and communication technologies, as well as their application, in 2019 significant changes in the structure of this index were recorded.

Namely, that year a redesigned NRI model appeared, whose hierarchical structure is shown in Graph 1: the first level is represented by four pillars (Technology, People, Government Regulation and Impact); the second level consists of three sub-pillars within each of the previous pillars, and the third level is composed of 62 indicators.

A similar NRI model was applied in 2020. In 2020, 60 indicators were included, of which 30 are numerical data, 13 are composite indices, and 17 are qualitative data. The complete NRI structure for 2019 and 2020, respectively, is shown in Table 1 and Table 2, respectively.

**Graph 1.** Structure of NRI index - redesigned model



**Source:** NRI Report 2019, p. 13.

If you look at the detailed structure of the NRI index in 2019 (Table 1), you can see the novelties, which reflect two types of changes that have taken place in recent years: on the one hand, changes due to the emergence and use of new information and communication technologies (the impact of technology), and on the other hand a strong influence of the social aspects of ICT application (social environment).

Namely, the redesigned NRI model includes such indicators as: availability of the latest technologies

(artificial intelligence, IoT, IoE, etc.), use of social networks, publication and use of open data, as well as application of digital transformation models in order to improve quality of life (happiness level, freedom of choice in life decisions and income inequality), consideration of gender, demographic and urban divisions (gaps) in the use of digital services, as well as the achievement of the United Nations Sustainable Development Goals (SDG) defined in 2015.

**Table 1.** Structure of the NRI index – 2019

<b>A. TECHNOLOGY PILLAR</b>	
<b>1<sup>st</sup> sub-pillar: Access</b>	1.2.2. Mobile app development
1.1.1 Mobile tariffs	1.2.3 Intellectual property receipts
1.1.2 Handset prices	<b>3rd sub-pillar: Future Technologies</b>
1.1.3 Internet access	1.3.1 Availability of latest technologies
1.1.4 4G mobile network coverage	1.3.2 Company investment in emerging technology
1.1.5 Fixed-broadband subscriptions	1.3.3. Government procurement of advanced technology products
1.1.6 International Internet bandwidth	1.3.4 ICT PCT patent applications
1.1.7 Internet access in schools	1.3.5 Computer software spending
<b>2nd sub-pillar: Content</b>	1.3.6 Robot density
1.2.1 Digital participation and content creation	
<b>B. PEOPLE PILLAR</b>	
<b>1st sub-pillar: Individuals</b>	2.2.3 Professionals
2.1.1 Internet users	2.2.4 Technicians and associate professionals
2.1.2 Active mobile-broadband subscriptions	2.2.5 Extent of staff training
2.1.3 Use of virtual social networks	2.2.6 R&D expenditure by businesses
2.1.4 Tertiary enrollment	<b>3rd sub-pillar: Governments</b>
2.1.5 Adult literacy rate	2.3.1 Government online services
2.1.6 ICT skills	2.3.2 Publication and use of open data
<b>2nd sub-pillar: Business</b>	2.3.3. ICT use and government efficiency
2.2.1 Firms with websites	2.3.4 R&D expenditure by governments and higher education
2.2.2 Internet shopping	
<b>C. GOVERNANCE PILLAR</b>	
<b>1st sub-pillar: Trust</b>	3.2.4 E-commerce legislation
3.1.1 Rule of law	3.2.5 Social safety net protection
3.1.2 Software piracy rate	3.2.6 ICT regulatory environment
3.1.3 Secure Internet servers	<b>3rd sub-pillar: Inclusion</b>
3.1.4 Cybersecurity	3.3.1 E-participation
3.1.5 Online trust and safety	3.3.2 Socioeconomic gap in use of digital payments
<b>2nd sub-pillar: Regulation</b>	3.3.3 Availability of local online content
3.2.1 Regulatory quality	3.3.4 Gender gap in internet use
3.2.2 Ease of doing business	3.3.5 Rural gap in use of digital payments
3.2.3 Legal framework's adaptability to digital business models	
<b>D. IMPACT PILLAR</b>	
<b>1st sub-pillar: Economy</b>	4.2.4 Healthy life expectancy at birth
4.1.1 Medium and high-tech industry	<b>3rd sub-pillar: SDG Contribution</b>
4.1.2 High-tech exports	4.3.1 Access to basic services
4.1.3 PCT patent applications	4.3.2 Pollution
4.1.4 Labor productivity per employee	4.3.3 Road safety
<b>2nd sub-pillar: Quality of Life</b>	4.3.4 Reading proficiency in schools
4.2.1 Happiness	4.3.5 Math proficiency in schools
4.2.2 Freedom to make life choices	4.3.6 Use of clean fuels and technology
4.2.3 Income inequality	

**Source:** Dutta, S. and Lanvin, B. (eds.) (2019), The Network Readiness Index 2019: Towards a Future-Ready Society, Portulans Institute, 2019, p. 290

**Note:** In the shaded part of the table, the novelties in the structure of the NRI index in relation to the previous structure are marked.

The basic structure of the NRI index (at the first two levels) in 2020 remained unchanged compared to 2019. Differences between the NRI index 2019 and 2020 are observed at the third level - the level of indicators. The NRI structure has been enriched in 2020 with indicators such as: using Github,

publishing, editing and using Wikipedia, accepting new technologies (emerging technology), government promotions of investments in new technologies, online access to financial accounts, online shopping, gig prevalence economy, the achievement of sustainable UN goals, such as the

following goals: goal no. 3 (Good health and well-being), goal no. 4 (Quality of education), goal no. 5 (Gender equality), goal no. 7 (Availability of clean energy) and goal no. 11 (Cities and communities with sustainable development).

**Table 2.** Structure of NRI index - 2020

<b>A. TECHNOLOGY PILLAR</b>	
<b>1st sub-pillar: Access</b>	1.2.2. Wikipedia edits
1.1.1 Mobile tariffs	1.2.3 Internet domain registrations
1.1.2 Handset prices	1.2.4. Mobile app development
1.1.3 Internet access	<b>3rd sub-pillar: Future Technologies</b>
1.1.4 4G mobile network coverage	1.3.1 Adoption of emerging technologies
1.1.5 Fixed-broadband subscriptions	1.3.2 Investment in emerging technologies
1.1.6 International Internet bandwidth	1.3.3 ICT PCT patent applications
1.1.7 Internet access in schools	1.3.4 Computer software spending
<b>2nd sub-pillar: Content</b>	1.3.5 Robot density
1.2.1 Github commits	
<b>B. PEOPLE PILLAR</b>	
<b>1st sub-pillar: Individuals</b>	2.2.3 Professionals
2.1.1 Internet users	2.2.4 Technical and associate professionals
2.1.2 Active mobile-broadband subscriptions	2.2.5 Business use of digital tools
2.1.3 Use of virtual social networks	2.2.6 R&D expenditure by business
2.1.4 Tertiary enrollment	<b>3rd sub-pillar: Governments</b>
2.1.5 Adult literacy rate	2.3.1 Government online services
2.1.6 ICT skills	2.3.2 Publication and use of open data
<b>2nd sub-pillar: Business</b>	2.3.3. Government promotion of investment in emerging technologies
2.2.1 Firms with websites	2.3.4. R&D expenditure by governments and higher education
2.2.2 Ease of doing business	
<b>C. GOVERNANCE PILLAR</b>	
<b>1st sub-pillar: Trust</b>	3.2.4. E-commerce legislation
3.1.1 Secure Internet services	3.2.5. Privacy protection by law content
3.1.2 Cybersecurity	
3.1.3 Online access to financial account	<b>3rd sub-pillar: Inclusion</b>
3.1.4 Internet shopping	3.3.1 E-participation
	3.3.2 Socio-economic gap in use of digital payments
<b>2nd sub-pillar: Regulation</b>	3.3.3 Availability of local online content
3.2.1 Regulatory quality	3.3.4 Gender gap in Internet use
3.2.2 ICT regulatory environment	3.3.5 Rural gap in use of digital payments
3.2.3 Legal framework's adaptability to emergng technologies	
<b>D. IMPACT PILLAR</b>	
<b>1st sub-pillar: Economy</b>	
4.1.1 Mediun-and high-tech industry	4.2.3 Income inequality
4.1.2 High-tech exports	4.2.4 Healthy life expectancy at birth
4.1.3 PCT patent applications	<b>3rd sub-pillar: SDG Contribution</b>
4.1.4 Labor productivity per employee	4.3.1 SDG 3: Good Health and Well-Beeing
4.1.5. Prevalence of gig economy	4.3.2 SDG 4: Quality Education
<b>2nd sub-pillar: Quality of Life</b>	4.3.3 SDG 5: Gender Equality
4.2.1 Happiness	4.3.4 SDG 7: Affordable and Clean Energy
4.2.2 Freedom to make life choices	4.3.5 SDG 11: Sustainable Cities and Communities

**Source:** Dutta, S. and Lanvin, B. (eds.) (2020), The network readiness index 2020, Accelerating Digital Transformation in a post-COVID Global economy, Portulans Institute, 2020, p. 284

**Note:** In the shaded part of the table, the novelties in the structure of the NRI index in relation to the structure in 2019 are marked.

#### 4. NRI INDEX DURING THE COVID CRISIS AND DIGITAL TRANSFORMATION

As we previously pointed out, the purpose of the NRI index is to help decision makers at various levels of socio-economic development, business leaders, academia, as well as all citizens and their associations, to see the results achieved and determine the direction of society in the digital age.

The changes that have occurred in the structure of the NRI index, which we discussed in the previous part of the paper, reflect both ICT changes and their broader social context, i.e. the impact of ICT on the overall socio-economic development of national economies.

Based on the data from the NRI report for 2019 and 2020, it is evident that ICT changes and their social acceptability have been realized with different intensity in some countries - leading European countries (in the top ten ranked countries are only Singapore and the US as countries outside Europe), while African countries are in the last 20 positions.

The best ranked countries have the highest results in all indicators of the NRI index, so in general, their achievements represent new benchmarks for those countries that lag behind.

It is important to note that the redesigned NRI index provided a good framework for tracking the sudden changes in the digital sphere that occurred during the COVID crisis. Among these changes are certainly new business models, corrected existing business models, as well as models and ways of performing other human activities during a pandemic, supported by information and communication technologies.

These technologies represent the core of networked economies, or the *conditio sine qua non* for global connectivity.

New digital models bring a new "normality" of functioning, which is believed to be maintained in the post COVID period.

As Agarwal, A. points out, "we already see a whole new architecture for the next phase (of networking that is) evolving - the Next-Gen Digital Network" (NRI Report 2020, p. 9).

This network will be created in a completely new way by connecting four special technological flows: wired and wireless networking, software and hardware, connectivity and computation, and open-source access.

This network is expected to bring the world high-quality and affordable Internet" (NRI Report 2020, p. 9).

Even before the crisis, there were significant digital initiatives and the adoption of digital strategies, but the pandemic accelerated the mass application of many digital tools, especially those for remote work.

Can be said that this mass application is unprecedented in the history of the use of ICT in certain areas (such as, for example, education). Also, the COVID crisis has contributed to the acceleration of the process of digitalization of business, which in many cases has led to the realization of more radical forms of digitalization - digital transformation.

Although there are dilemmas about defining digital transformation at the national level, it is evident that this process is ongoing in many countries.

The redesigned NRI model provides an opportunity to monitor digital transformation at the national level.

Based on the movement of the NRI index value (observed by all its indicators) in 2020, some general conclusions and tendencies related to digital transformation can be reported (NRI Report 2020, pp. 18 -19):

- The process of digital transformation at the national level should be viewed as a multidimensional phenomenon. This practically means that each country has to deal with different aspects of the process, where the realized achievements within the NRI index can be taken as an important guideline.
- The COVID crisis has contributed to accelerating the process of digital transformation. This is especially true for the ways of working, learning, communicating, competing and collaborating.
- Education and training of employees in acquiring new skills will greatly influence the process of digital transformation.
- Digital transformation, in turn, can contribute to the achievement of the United Nations Sustainable Development Goals (SDGs). One special NRI sub-pillar (with 5 indicators) is dedicated to monitoring the implementation of these goals.
- Digital transformation can help to enhance global cooperation between national economies, but also to redefine the process of globalization, where great

emphasis would be placed on a number of common values, such as: protection of environment, reduction of social inequality, sustainable energy sources and sustainable development of cities and communities.

- Given that some technologies, such as artificial intelligence technologies, can have a significant impact on the labor market, it is clear that the issue of digital transformation is becoming sensitive for decision makers at various levels.
- The COVID crisis, through its effects on the digital transformation, can lead to the emergence of new forms of digital division, but also deepen existing divisions. The NRI index framework can detect these phenomena, and NRI index reports are expected to provide more information in the coming years.
- The trust and security of individuals and firms in the digital sphere (especially covered in the NRI model) are crucial for digital transformation. Therefore, these issues must be high on the agenda of digital strategies of national economies.

Based on all the above, it can be concluded that the redesigned NRI index model provides a good framework for monitoring a wide range of digital and social changes at the level of national

economies, and that these trends are likely to continue in the post-COVID period.

### 5. Profile of Serbia in the domain of NRI index

The NRI report for 2019 presents data for 121 countries, while for the next 2020 the report has been expanded to 134 countries whose total gross product makes up 98% of the global gross domestic product (GDP). In the general ranking of all countries in the top 10 best ranked countries are 8 European countries, and Serbia ranks 52nd in both years.

According to the data in Table 3, we can see that Serbia ranks between 42 and 65 in terms of most NRI sub-pillars, with the exception of *Future Technologies* - 103 rank and *Achieving Sustainable Development Goals* - 73 rank. So, relatively compared to other countries in the world, which are included in NRI monitoring and reporting, Serbia has worse results in these two areas.

More detailed information on the relative position of Serbia can be obtained on the basis of data on its rank at the level of individual NRI indicators. Table 4 shows the positions of Serbia for the 5 best and 5 worst achievements at the level of individual NRI indicators.

**Table 3.** Rank of Serbia by the value of NRI index and second level indicators - sub-pillars in 2020. (134 countries in total)

NRI index– level	Rank (out of 134)
<b>NRI index</b>	52
<b>A. Technology pillar</b>	53
Access	51
Content	42
Future Technologies	<b>103</b>
<b>B. People pillar</b>	52
Individuals	65
Business	48
Governments	49
<b>C. Governance pillar</b>	54
Trust	57
Regulation	63
Inclusion	56
<b>D. Impact pillar</b>	54
Economy	48
Quality of life	55
SDG Contribution	<b>73</b>

Source: NRI Report 2020, p. 172

**Table 4.** Relative position of Serbia according to the value of NRI indicators - 5 best and 5 worst achievements (according to rank) in 2020.

NRI indicators	Rank (out of 134)
<b>NRI indicators with the highest rank</b>	
2.2.1. Firms with website	19
2.1.5. Adult literacy rate	21
3.2.2. ICT regulatory environment	21
1.1.5 Fixed-broadband subscriptions	28
2.3.4. R&D expenditure by governments and higher education	32
<b>NRI indicators with the lowest rank</b>	
4.3.4. SDG 7: Affordable and Clean Energy	109
1.3.4. Computer software spending	106
1.3.2. Investment in emerging technology	93
2.1.3. Use of virtual social networks	91
4.2.2. Freedom to make life choices	91

Source: NRI Report 2020, p. 172

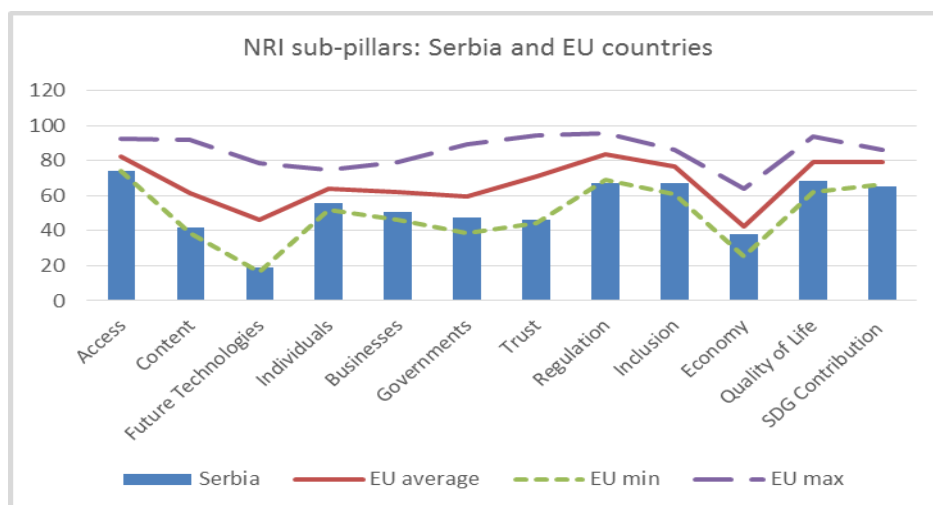
Below we present the position of Serbia according to the value of NRI sub-pillars in comparison with the countries of the European Union and the Western Balkans countries.

Graph 2 shows the values of 12 NRI sub-pillars for Serbia (column display) compared to the average, minimum and maximum values of these sub-

pillars for the countries of the European Union (line view).

It can be seen that Serbia follows the development of the values of these indicators for EU countries and that it is at the level of the minimum values of EU countries.

**Graph 2.** Values of NRI sub-pillars for Serbia and EU countries



Source: Authors calculation on the basis of NRI 2020 data.

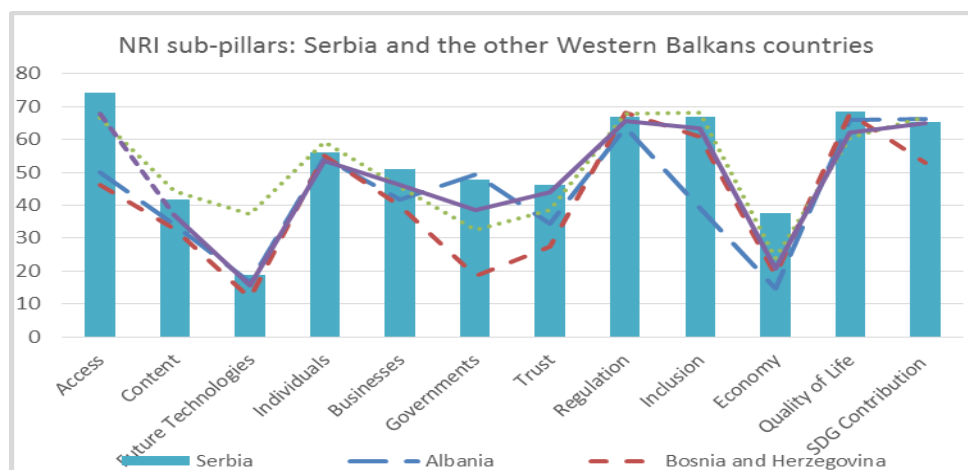


Also, it is important to consider the position of Serbia in terms of the value of NRI sub-pillars in comparison with the countries of the Western Balkans region to which Serbia belongs.

It is interesting that all countries in the Western Balkans region, including Serbia, have a similar

trend in the value of NRI sub-pillars: the weakest achievements are within the sub-pillars Technologies of the Future and Impact on the Economy, and the highest achievements are for sub-pillars: Access to Technology, Legal Regulation, Inclusion and Quality of Life.

**Graph 3.** Values of NRI sub-pillars for Serbia and other countries in the Western Balkans region

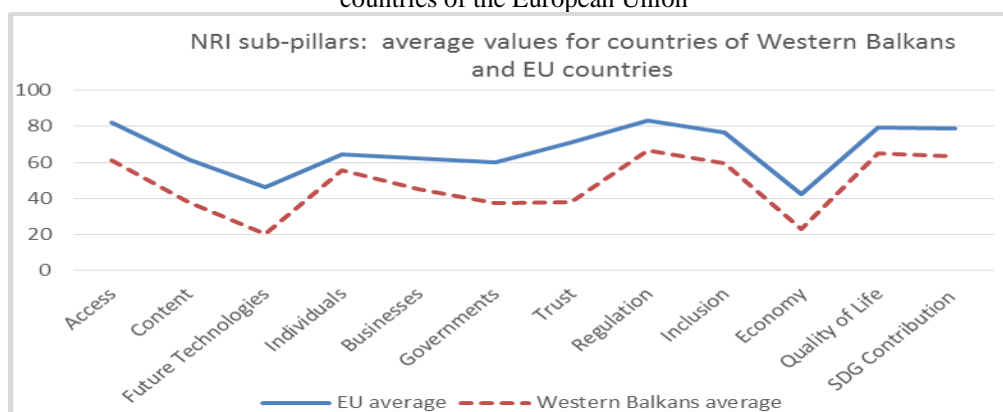


**Source:** Authors calculation on the basis of NRI Report 2020 data.

Finally, Graph 4 shows the movement of the average values of NRI sub-pillars for the countries of the Western Balkans and the countries of the European Union. It is obvious that there is an almost "stable lag" of the countries of the Western Balkans behind the countries of the European

Union regarding all sub-pillars. The most pronounced is the lag in the field of Future Technologies and Confidence in the use of Internet technologies, and the least lagging behind is in the field of Human Resources, namely the readiness and skills of individuals to use ICT.

**Graph 4.** Average values of NRI sub-pillars for the countries of the Western Balkans and countries of the European Union



**Source:** Authors calculation on the basis of NRI 2020 data.

## CONCLUDING REMARKS

This paper deals with the review of important changes that are taking place in monitoring the readiness of countries to implement new ICT in all spheres of economic and social development. The central place in the work is dedicated to the

Network Readiness Index-NRI, with all the changes in the structure of this index that were recorded in 2019 and 2020. As we pointed out in the introductory part, in 2019 a new, redesigned NRI model appears, which rests on four key pillars: Technology, People, Government Regulation and Impact. This model was created

under the influence of significant technological changes, but also changes in the relation technology-society, i.e. changes in social development. In addition to the above, due to additional circumstances, the whole world was affected by the COVID health crisis in 2020, which affected all aspects of people's lives and work. In the new circumstances, digital technologies intended for communication, data exchange and teleworking have become extremely important. The redesigned NRI index provided a broad framework for monitoring the digitization and digital transformation process at the country level. This framework is expected to be adequate in the post-COVID period as well.

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## SUMMARY

The aim of this paper is to present current trends in monitoring the readiness of countries to implement

information-communication technologies (ICT). Special emphasis has been placed on the last few years, including the period of the COVID crisis. There are several indicators used for this purpose, but in this paper we have concentrated on the application of the Network Readiness Index - NRI index.

The purpose of the NRI index is to help decision makers at various levels of socio-economic development, business leaders, academia, as well as all citizens and their associations, to see the results achieved and determine the direction of society development in the digital age. The structure of this index was relatively stable for almost two decades before 2019. In 2019, there were significant changes in the structure of the index, which were accompanied by corrections in 2020. The redesigned NRI model was created under the influence of two factors. On the one hand, these are significant ICT changes, such as: the application of SMAC technologies (*social networks, mobile apps, analytics, cloud computing*), *big data, Internet of Things-IoT, Internet of Everything-IoE*, virtual reality, artificial intelligence – AI, smart appliances, offices and cities, etc. On the other hand, there have been changes in the ICT-society relationship, i.e. social changes. At the same time, due to sudden outbreak of the COVID pandemic, this index is expected to fit into the “new reality” caused by the COVID pandemic. In this regard, it can be said that the redesigned NRI index provides a good framework for tracking the changes in the digital sphere that occurred during the COVID crisis. Also, in the post-COVID period, NRI methodology is expected to be able to track all changes in the digital world, to recognize all-present computing and to reflect the position of each country in the networked world.

In addition to the above, we have considered the profile of Serbia in the NRI domain. In the general ranking of all countries, Serbia ranks 52nd in 2019 and 2020. Relatively in comparison with other countries of the world, Serbia has more unfavorable results in the field of Future Technologies (103 rank) and achieving the UN Sustainable Development Goals – SDGs (73 rank). Compared to EU countries, in terms of the value of key NRI sub-pillars, Serbia is at the level of minimum values of EU countries. Compared to the surrounding countries - countries in the Western Balkans region, Serbia has shown a similar trend in the value of NRI sub-pillars. The weakest achievements are within the sub-pillars of Future Technologies and the ICT Impact on the Economy, and the highest achievements are for the sub-pillars: Access to Technologies, Legal Regulation, Inclusion and Quality of Life.