Serbia
Digital Development Country Profile

Living Document

Comments/Inputs =>ITU Office for Europe (EURregion@itu.int)

With the contribution of[logos of UN Agencies contributing to the document]:

Acknowledgements

This Digital Development Country Profile was developed by the ITU Office for Europe within the framework of the ITU Regional Initiative for Europe on ICT Centric Innovation Ecosystems.

It was elaborated by Ms. Nevena Manić and Mr. Aaron Spitler, Consultant, under the supervision of Ms. Sarah Delporte, Project Officer at ITU Office for Europe and direction of Mr. Jaroslaw Ponder, Head of ITU Office for Europe. ITU would also like to acknowledge the contribution of Ms. Valentina Stadnic, Digital Service Officer, from the ITU Office for Europe.

As digital transformation is a complex and dynamic process, this document is to be treated as a living document that can be amended at any point in time depending on the availability of additional information. Comments and additional inputs should be sent to the ITU Office for Europe (EURregion@itu.int).

Table of Contents

1. Introduction

1.1 Background and Context

Development through digital transformation is a complex issue and touches on many enablers, from broadband availability to policies and sectoral e-strategies, as well as specific programmes fostering digital inclusion or the development of innovative communities.

Various independent research projects have been carried out by the International Telecommunication Union (ITU), United Nations (UN) agencies, and stakeholders in understanding these enablers, their impact on countries, the gaps, and opportunities. However, these studies may not reflect the inherent interdependencies among them. There is a need to provide a simple view and narrative about a country's capacity to digitally transform, and the various components contributing to this process.

Digital development has become ever more important since the outbreak of the COVID-19pandemic, and various UN agencies and other stakeholders have assisted countries in their respective capacities relying substantially on the digital component.

Extending the availability of products and services, and empowering citizens, workers, and students in their daily engagements and needs during times of lockdown have become clear priorities in all countries. The ability to leverage the progress made in the digital sphere has become an important factor in determining resilience during the COVID-19 crisis and its aftermath.

As the situation is developing into a new normal where "digital" is not only a solution to an emergency but a long-term investment against risk, it is necessary to unravel the various dimensions of digital development in different countries as information and communication technologies (ICTs) become increasingly important for the achievement of the Sustainable Development Goals (SDGs) by 2030.

1.2 Objective of the Report

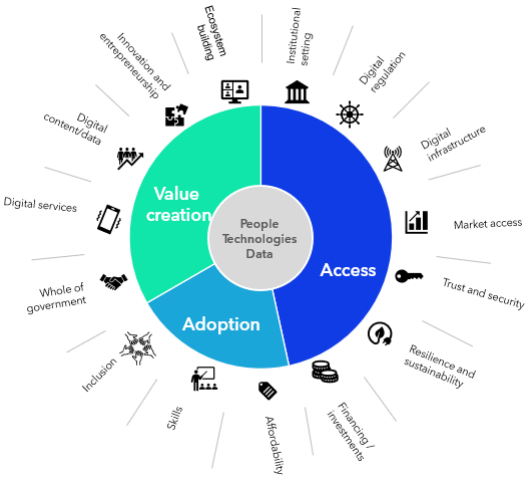
The aim of the Digital Development Country Profiles series is to provide a comparative analysis for the countries of the European region with UN in-country presence, namely Albania, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia, and Ukraine.

The report addresses digital transformation based on the various experiences of ITU, the UN specialised agency for ICTs, and other UN system organisations, offering a broad overview of the activities and projects being implemented at the national level and in the wider region.

This document seeks to create a reference for discussions on digital development at the country level in Serbia. It will serve as a guide for future dialogue with country stakeholders and pave the way for increasing fit-for-purpose engagements of the UN system in the country. It will equip decision-makers at the national level and international stakeholders with an overview of the various components of digital development at the country level.

1.3 Methodology

The research has identified a *three-building block framework* that analyses digital transformation from a variety of perspectives, enabling an understanding of how the various dimensions of digital development interact at the country level. Below is a summary of each building block and an elaboration of how the particular dimension fits in the overall digital development scenario of the country. The figure on the side demonstrates a visual representation of the framework, with its building blocks and related components.



1) Access: Robust ICT infrastructure represents a critical precondition for the transformation of a country. It provides the foundation for innovative services and economic activity to take place. With the COVID-19 pandemic, countries and communities lacking connectivity faced a greater disruption than those who did not, therefore raising the overall importance of reliable and safe infrastructure and services that are available to all. ICT infrastructure needs to be evaluated based on several aspects critical to meaningful connectivity. Government holds a central role in promoting the right strategies collaboratively across various entities. This includes setting in place the conditions for the ideal mix of policies and regulations to facilitate attainment of universal and affordable connectivity through resilience infrastructure deployments, ensuring ubiquitous network coverage that includes “last mile” and hardest-to-connect under-resourced areas.

2) Adoption: Developing digital skills and building human capacities to empower citizens, strengthen employability, and create new job opportunities is essential to match the needs of the gigabit society. The pandemic has exacerbated pre-existing inequalities, especially among refugees, migrants, persons with disabilities, women, and girls. While connectivity is the backbone of digital transformation, adopting a “people-centric” digital transformation is vital to ensure that all members of society are not only connected but meaningfully connected and, thus, fully enjoy the fruit of an ever-growing digital world. To this end, special emphasis should be given to bridging the digital divide and equipping all groups in society, including those with specific needs, to take advantage of ICTs by accelerating digital skills development.

3) Value Creation: Access to government services by citizens enables productivity, transparency, and equality in digital development. Ensuring that public services are delivered digitally is an important component of digital transformation, triggering a reduction in costs and bureaucracy all while increasing efficiency. Governments also have an important role in guaranteeing that public sector transformation becomes a catalyst for digital transformation in the wider economy. Most economic benefits accumulate when ICTs are also used to transform other sectors. Most economic benefits accumulate when ICTs are also used to transform other sectors, such as agriculture or health, which are key to unlock job creation and economic inclusion. Going beyond the digitalization of sectors, there is a need to create an enabling environment supporting digital innovation to accelerate digital transformation within a particular country. The ability to digitally innovate domestically is also considered a sign of maturity which leverages the two building blocks addressed previously. Without entrepreneurship-driven innovation, economic opportunities will remain unexplored and the global competitiveness of countries in an increasingly digital landscape is placed at risk. Through strong digital innovation ecosystems, countries can benefit from increased productivity, economic growth, and employment opportunities that catalyse digital transformation while ensuring that long-term digital development has a positive impact on a country's broader economic development.

The country profiles benefitted from secondary research, including various ITU publications, activities, and statistics. Moreover, content generated by other stakeholders, including reports and publications, was incorporated into the document. Each piece of information is presented using the context of the relevant building block under which the details have been inserted, and therefore adopts one of the three perspectives on digital transformation.

2. Country Profile – Serbia

2.1 Building Block 1: Access

Broadband development is of primary importance and remains a prerequisite to ensure digital development. It is the backbone for every aspect of the economy, acting as a fundamental enabler for businesses, consumers, and citizens. Safe and reliable access to the next generation of infrastructure (fixed, mobile, wireless, satellite) and ICTs are necessary for advancing sustainable development. Creating the right conditions for digital technologies to be broadly utilized will accelerate economic growth in the wider region. From revamping institutional practices to revising legal frameworks, expanding digital access to all demographic groups must be prioritized.

This section will provide a general overview of i) the institutional setting in charge of policymaking efforts related to ICTs and digital development; ii) rules and regulations related to digital; iii) the present state of digital infrastructure; iv) market dynamics; v) security matters; vi) system resilience; and vii) funding structures and measures to attract investment.

2.1.1. Institutional Setting

Serbia's journey toward digitalization and the development of Information and Communication Technologies (ICTs) involves a collaborative effort among various agencies, each with distinct roles and responsibilities. Stakeholders recognise a clear government vision and strategy for digitalization. Digitalisation has been a key priority and has been promoted by the Prime Minister and the Office for IT & eGovernment. The Prime Minister's Office is well connected to all ecosystem players and there is support for a shared vision.

The Ministry of Information (Media) and Telecommunications plays a very important role in these efforts, as the majority of their work revolves around the process of digitalisation in the country. Namely, the Ministry is responsible for electronic communications, universal service, ICT policies and infrastructure, data protection and information security.[1]

The Regulatory Agency for Electronic Communications and Postal Services (RATEL) has been tasked with addressing legal issues related to digital communications, as well as advocating for consumer interests within this growing field.[2] The Academic Network of the Republic of Serbia (AMRES) is responsible for conducting scientific research regarding the information society and regularly coordinates with international institutions in knowledge-sharing exercises.[3] Telekom Srbija, a state-owned service provider, has played a leading role in expanding telecommunication networks within the Balkan country.[4] The Office for IT and eGovernment is in charge of integrating ICTs into administrative bodies and procedures, while the Ministry of Public Administration and Local Self-Government manages these modernisation efforts at the sub-national level.[5][6] Meanwhile, the Serbian Development Agency (RAS) is dedicated to attracting investments and supporting economic development, with a particular focus on the burgeoning ICT sector. The Innovation Fund further fuels innovation and entrepreneurship in Serbia, offering funding, mentorship, and support to start-ups and innovative companies, contributing to the country's digitalization efforts. The Fund aims to improve the links between science, technology and the economy and contribute to encouraging the development of innovative entrepreneurship by supporting innovative entrepreneurship, especially in the early stages of development; connecting scientific research organizations and private companies for the development and commercialization of innovations; enabling new products, technologies and services to enter the market and establishing long-term institutional

[1] For more information about the Ministry of Information and Telecommunications, visit the following link:https://mit.gov.rs/tekst/125/nadleznosti-ministarstva.php
[2] For more information about RATEL, visit the following link: https://www.ratel.rs/en/.
[3] For more information about AMRES, visit the following link: https://www.amres.ac.rs/en.
[4] For more information on the mission and governance of Telekom Srbija, visit the following link: https://mts.rs/About-Telekom/About-us.
[5] For more information about the Office for IT and eGovernment, visit the following link: https://www.ite.gov.rs/tekst/en/124/office-for-it-and-egovernment.php.
[6] For more information about the Ministry of Public Administration and Local Self-Government, visit the following link: http://mduls.gov.rs/en/about-ministry/.

support of the state for innovative entrepreneurship in cooperation with international financial institutions, organizations, donors and the private sector.[7] Also, the Ministry of Science, Technological Development and Innovation is the key institution for proposing and implementing of policies regarding scientific and technological development, and innovation.[8] In 2023, Ministry has launched eScience information system.[9] eScience information system is intended to unify the entire scientific production in one place and enable the evaluation of scientific results of institutions. The system establishes registers of scientific research organizations, the researchers, scientific research equipment and introduces repositories of scientific results. The new system enables significantly more visibility to the domestic and international public, which is especially important for the development of international scientific cooperation, fulfilling the social mission and pushing the boundaries of knowledge.

Ministry of Finance is also an important institution for the digital development of the country. The Ministry and the Tax Administration in 2022 initiated eFiscalization, making the use of a new hardware or software solution mandatory, through which fiscal invoices with a QR code are now being issued. By scanning the QR code, customers and service users can check whether the invoice has been issued in accordance with the law, establish a connection with the Tax Administration, and receive information on whether their invoice is valid. This system brings numerous benefits to the state, economy and citizens and is an important tool in the fight against informal economy.[10]

Several nongovernmental stakeholders also play a pivotal role. The Serbian Chamber of Commerce, in tandem with its Center for Digital Transformation, are very important for Serbia's business landscape. The Center for Digital Transformation of the Chamber of Commerce is a crucial resource for businesses seeking to navigate the complexities of the digital age.[11] Through advisory services, training, and access to valuable resources, it empowers companies to enhance their digital capabilities and competitiveness. By fostering connections among businesses and technology stakeholders, the center facilitates collaborations and partnerships that drive digital innovation. It plays a significant role in promoting data-driven decision-making, cybersecurity awareness, and effective digital marketing strategies. In essence, Center for Digital Transformation, with support of the Chamber of Commerce in whole, fosters collaboration among various stakeholders, including businesses, academia, and government agencies, as they embrace digital technologies, adapt to the digital landscape, and strive for growth in the digital economy. Lastly, the organization National Alliance for Local Economic Development (NALED) works diligently to improve the local business environment by advocating for regulatory reforms and best practices, especially in areas related to e-government and digital services, thus facilitating economic development at the grassroots level.[12] Cooperation amongst all these actors is critical for accelerating the integration of ICTs into all aspects of society in Serbia.

[7] For more information about Innovation Fund, visit the following link: https://www.inovacionifond.rs/en/fond/about-fund
[8] For more information about the Ministry of Science, Innovation and Technological Development, visit the following link: https://nitra.gov.rs/en/ministarstvo/o-nama
[9] eScience Portal https://enauka.gov.rs/?locale=en
[10] eFiscalization Portal http://budiefiskalizovan.gov.rs/
[11] For more information about Center for Digital Transformation, visit the following link: https://www.cdt.org.rs/
[12] For more information about NALED, visit the following link: https://naled.rs/

2.1.2. Digital Regulation

Connectivity policies and regulations

From a regulatory standpoint, the Serbian government has been in lockstep with its counterparts in the European Union (EU). Considering its status as an accession country, strategic documents are heavily influenced by pre-existing EU frameworks and the EU's Digital Agenda. According to the European Commission Progress Report 2023, Serbia has made good progress on digital transformation across the economy. Digitalisation remains a key priority for the government.[13]

The country's efforts to EU accession are reflected into several national policies.[14] Strategy for the Development of Next Generation Networks by 2023's measures include **i**mplementing reforms that facilitate integration into the EU's single market; **i**nvestment in modern technologies as a means of spurring sustainable economic growth and promoting policies that would ensure produced goods are competitive within foreign markets.[15] The Strategy of Digital Skills Development in the Republic of Serbia for the Period 2020-2024 is important as it aims to improve access to digital knowledge-sharing; invest in digital skill-building programs for all citizens, especially vulnerable groups; and sponsor programs that keep the country abreast of ICT developments across all areas, bearing in mind changes in the business and labour markets.[16] The Information Society and Information Security Development Strategy 2021–2026 has the overarching objective of developing an information society, citizen and business-oriented electronic government and improving information security for citizens, public administration, and businesses.[17]

Looking at the wider regulatory environment, Serbia scored at 94.5 out of 100in the 2022 ITU *ICT Regulatory Tracker* rankings, three points higher than in 2017.[18] This Tracker showcases the evolution of regulatory environments of participating countries. In the case of Serbia, continuous progress was noted within the six-year period. The Tracker also facilitates benchmarking and the identification of both trends and gaps in ICT legal and regulatory frameworks, providing guidance to decision makers to construct reforms to create a vibrant and inclusive ICT sector. The tracker consists of a comprehensive metric, incorporating 50 indicators, that produce four clusters:

[13] European Commission Progress Report 2023 https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_695_Serbia.pdf
[14] For a more detailed breakdown of planning documents, visit the following link: https://mtt.gov.rs/extfile/sr/35315/Information%20Society%20and%20InfoSec%20Strategy%202021-2026111.pdf.
[15] Strategy for the Development of Next Generation Networks by 2023's (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2018/33/1
[16] Strategy of Digital Skills Development in the Republic of Serbia for the Period 2020-2024 (Serbian) http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2020/21/2/reg
[17]Information Society and Information Security Development Strategy 2021–2026 (Serbian) http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2021/86/1/reg
[18] ITU Regulatory Tracker, ITU (2022), https://app.gen5.digital/tracker/country-cards/Serbia.

1. Regulatory authority (focusing on the functioning of the regulatory entity): Serbia received a 20 out of 20;
2. Regulatory mandates (who regulates what): Serbia scores a 19.5 out of 22;
3. Regulatory regime (what regulation exists in major areas): Serbia earned a score of 28 out of 30;
4. Competition framework for the ICT sector (levels of competition in main market segments): Serbia reached 27 out of 28.

Based on these benchmarks, Serbia is among the countries with a *Fourth-Generation regulatory regime (G4)*, that is integrated and led by economic and social policy goals. The country's overall result (94.5) is slightly higher than the European (94.1) average and well above the world average (73.7).

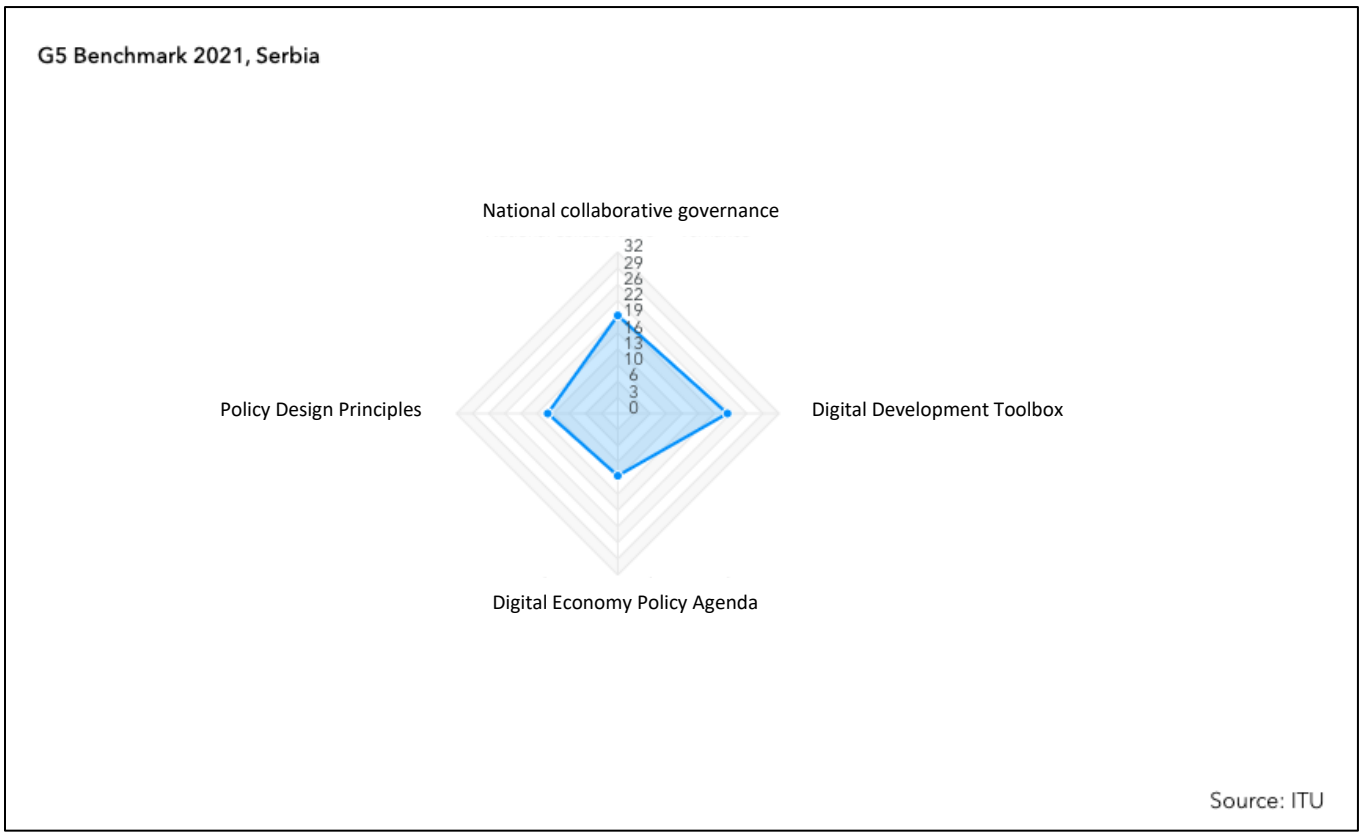
Figure 1. ICT Regulatory Tracker – Serbia (2007-2022)

Source: ITU

At present, the gold standard for regulatory policy is the *Fifth- Generation (5G)*, which focuses on collaboration amongst diverse stakeholders within the ICT sector and with other sector of the economy. Looking at Serbia, the country is well on its way to achieving this goal. Serbia had an overall score of 54 in the G5 benchmark, which shows progress can be made to reach Europe's 2021 score of 69.9, particularly in categories such as Pillar II (Policy Design Principles) and Pillar IV (Digital Economy Policy Agenda).[19]

[19] The Benchmark of Fifth Generation Collaborative Regulation, ITU (2021), https://digitalregulation.org/wp-content/uploads/G5Benchmark_ReviewBoardReport_21062021.pdf.

Figure 2. G5 Benchmark – Serbia (2021)



Next generation infrastructure: 5G Regulations

Serbia's "Strategy for the Development of New-Generation Networks until 2023", adopted in 2018 and drafted with the help of the EU, sets out clear priorities for infrastructural development.[20] It outlines how mobile networks must be updated to be 5G-compatible, putting forward the disruptive potential of 5G in the communication landscape. The strategy notes how 5G is linked with an increase in gross domestic product (GDP), unleashing socio-economic growth that can transform the domestic economy. With this goal in mind, the strategy includes the following targets:[21]

- Developing a backbone for the broadband network by consolidating the infrastructure that is state-owned;

[20] Plans for 5G Implementation in Serbia https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2018/5G%20Greece/Session%201%20Irini%20Reljin%20-SERBIA%20-%20Serbia_5G%20plans_Athens_2018%20IR.pdf.

[21] Strategy for the Development of New-Generation Networks until 2023 (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2018/33/1

- Developing a broadband access network by:
    - Providing conditions to make it easier to construct broadband infrastructure through the enactment of a broadband law – this will help telecom operators reduce the cost of building such infrastructure by sharing existing infrastructure and facilitating the acquisition of necessary permits;
    - Providing state aid to operators or other legal entities that agree to build their networks in areas where there is little economic viability for the construction of broadband infrastructure.
- Preparing for spectrum auctions for the development of new technologies, and 5G in particular.

Other targets and goals that are relevant to 5G include:[22]

- Strengthening broadband capacities for the needs of state/public institutions;
- Offering a larger set of IP addresses by switching to Internet Protocol version 6 (IPv6);
- Providing state aid incentives for operators that switch to IPv6;
- Promoting the introduction and use of the Internet of Things (IoT);
- Promoting the introduction and use of smart services in all sectors of the economy;
- Promoting cloud computing and expanding data centres in the country;
- Adopting interoperability standards that would support the exchange of large amounts of data between different entities, with the aim of introducing smart services;
  Developing mechanisms for improving the safety of work on the internet;
- Improving the conditions for education of the population in the field of ICT at all educational levels.

Beyond creating policy, progress has been made in installing 5G networks across Serbia. In 2018, Serbia signed a letter of intent with Bulgaria and Greece to create the Thessaloniki-Sofia-Belgrade 5G cross-border corridor.[23] This designated area, reserved for testing driverless vehicles in motorway settings, acted as a "live experiment" for 5G rollout in the European region. In addition, the agreement included measures for data exchange, regulation harmonization, and policy coordination.

The deal between the trio of countries is an example of a pan-European effort to build 5G corridors across the wider region. Looking at the context of the Greece-Bulgaria-Serbia agreement, there are three major goals that speak to this larger, overarching ambition:[24]

- The corridor will provide a technologically neutral hub for industry, research centres, academic and any other stakeholders for testing and evaluating innovative mobility technologies;

[22] 5G implementation in non-European Union countries of the Europe region, ITU (2021), https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-THEM.19-2021-PDF-E.pdf.
[23] For more information on the corridor, visit the following link: https://digital-strategy.ec.europa.eu/en/news/new-5g-cross-border-corridor-connected-and-automated-mobility-announced-digital-assembly-2018.
[24] 5G implementation in non-European Union countries of the Europe region, ITU (2021), https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-THEM.19-2021-PDF-E.pdf.

- A "learning by experience" approach and exchange of information will be key features in the use of the corridor;
- Recognition and coordination in specific regulations on automated driving testing will be key aspects in the collaboration.

In June 2019, Telenor launched a test service from the first 5G station in Serbia, using a licence for spectrum in the 2,600 MHz and 3,500 MHz frequency bands. Housed in the Science-Technology Park Belgrade, this network came online in September 2019 for students at the University of Belgrade's School of Electrical Engineering which partnered on the collaborative project.[25] Local start-ups, including Novelic and DigitalWorx, have built on the foundation laid by Telenor to test out their own 5G-enabled products.[26]

"Smart-city" projects launched throughout the Balkan country have also tried to leverage the myriad of benefits of 5G technologies. For instance, the Government of Serbia signed an agreement with Chinese-based Huawei Technologies on a joint project based out of the cities of Belgrade, Novi Sad, and Nis.[27] At the practical level, the project consists of building a network of transmitters, along with a system for processing data collected by these devices which could enhance the service sector. The cooperation will culminate with the opening of the Huawei Innovation Centre for Digital Transformation in Belgrade.[28]

Significant progress has been made in 2023. Firstly, Law on Electronic Communications adopted in 2023 recognizes the existence of next-generation networks and the obligation to provide all citizens with a fast and secure internet was adopted.[29] In line with the adopted Law, the rulebook, which will define in more detail how 5G auction will be carried out has been open to public discussion. The Government is expecting to get the first users by the end of 2024. Further investment in 5G infrastructure would help boost Serbia's global competitiveness, attract long-term investment, and grow the digital economy.

Finally, another important development is expected to further accelerate introduction of next generation networks. In 2023, Belgrade, capital of Serbia was selected to be the host of the next Specialised EXPO 2027. The Government is fully committed to this project and announced Belgrade will undergo vast changes in order to adapt to the huge influx of visitors from all over the world. This relates to heavy investments in infrastructure, which greatly entails digital infrastructure as well.

[25] For more information about the school and their collaboration with Telenor, visit the following link: https://ntpark.rs/2019/06/21/telenor-pustio-u-rad-prvu-5g-baznu-stanicu-u-ntp-beograd/.
[26] 5G implementation in non-European Union countries of the Europe region, ITU (2021), https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-THEM.19-2021-PDF-E.pdf.
[27] 5G implementation in non-European Union countries of the Europe region, ITU (2021), https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-THEM.19-2021-PDF-E.pdf.
[28] For more information on the centre, visit the following link: https://industryeurope.com/sectors/technology-innovation/huawei-to-open-innovation-centre-in-serbia/. Huawei open https://global.chinadaily.com.cn/a/202009/16/WS5f617b77a31024ad0ba79db7.html
[29] Law on Electronic Communications (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/skupstina/zakon/2023/35/1/reg

2.1.3 Digital Infrastructure

Serbia has well-developed roads, public transport, and airport infrastructure and the second cheapest electricity prices in Europe. In addition, high-speed internet access is affordable and available throughout most of the country. By 2025, the aim is for 99% of households to have broadband internet. In rural parts of the country, access and availability to soft and hard infrastructure are limited. Only 69% of rural Serbian households are connected to fixed broadband, compared with 85% in urban areas. A government digitization project supported by the European Bank for Reconstruction and Development (EBRD) and bilateral donors under the Western Balkans Investment Framework (WBIF) aims to address this gap.[30] The first phase is aiming to connect around 90 000 households and 600 schools with fast broadband, is ongoing, while the second phase has been signed and a third phase is under consideration. The working group for drafting the Law on broadband in alignment with the Broadband Cost Reduction Directive was set up; however, the law remains to be adopted.[31]

Based on information from the ITU, Serbia boasts comprehensive network coverage. All of Serbia's population has access to mobile cellular networks, and virtually everyone, at 99 percent, is within the reach of at least 3G and 4G networks. These trends are in line with current European (99.8 percent) and global (95.9 percent) rates.[32] The ownership of mobile phones is widespread, with 96 percent of individuals possessing one, showing minimal difference between genders: 96 percent of women and 95 percent of men. In rural and urban households, internet access is available in 75 percent and 86 percent of homes, respectively, averaging to 83 percent overall, still standing below the average seen in Europe (89.5 percent). Computer ownership at home stands at 77%.

Mobile-cellular subscriptions exceed the population at 124 per 100 inhabitants, while landline subscriptions are at a lower rate of 37 per 100. Broadband connectivity is on the rise, with mobile-broadband subscriptions reaching 104 per 100 inhabitants, fixed broadband at 26 per 100, which is presently under the average seen in the European context (33.8 subscriptions per 100 inhabitants). For high-speed internet access, only 2% of the population with fixed broadband connections experience speeds below 10 Mbits/s, implying that the vast majority have higher speeds.[33]

In Serbia, internet usage is quite extensive, with 84% of the population going online. Broken down by gender, 81% of women and 86% of men are daily internet users. Age-wise, 79% of those aged between 25 and 74 are connected to the internet, whereas a striking 98% of the younger demographic, those aged 15 to 24, are internet users. According to 2022 ITU data, the average monthly data consumption

[30] Digital Innovation Profile (2022), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2022/Digital%20Innovation%20Profile%20Republic%20of%20Serbia.pdf
[31] European Commission Progress Report 2023 https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_695_Serbia.pdf
[32] World Telecommunication/ICT Indicators Database 2023 – Retrieved July 2023, ITU (2023), https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx.
[33] ITU Data Hub https://datahub.itu.int/data/?e=SRB

per fixed broadband subscription is remarkably high at 167,241 MB (megabytes), while mobile broadband usage is lower but still significant at 9,729 MB per subscription.

Table1 provides a useful summary of ITU indicators related to telecommunications and the internet for Serbia, in comparison to European and global standards. While Serbia has surpassed or approached European averages, there remain gaps in order to meet the standards set in the European region.

Table1. Telecommunications and Internet Indicators in Serbia alongside European and World Averages[34]

Key Indicators	Serbia	Europe	World
Fixed telephone subs per 100 inhabitants (2020)	37.0	30.9	13.9
Mobile cellular subs per 100 inhabitants (2020)	120.0	120.9	111.5
Active mobile broadband per 100 inhabitants (2020)	95.0	110	87
3G Coverage (% of population) (2020)	99.0	99.6	94.8
Individuals using Internet (%) (2022)	83.5	89.5	66.3
Households with Internet Access (%) (2020)	81.0	87.6	65.7
Fixed broadband subs per 100 inhabitants (2022)	26.2	35.4	17.6
Fixed broadband subs by speed (% of distribution):	--		
256 kbit/s to 2 Mbit/s (2020)	0.128	0.3	1.8
2 to 10 Mbit/s (2020)	3.0	6.4	6.7
>> 10 Mbit/s (2020)	95.0	92.3	89.9

According to the ITU report on *The Status of Connectivity in 9 Non-EU Countries of Europe Region* (2021), Serbia is largely on par with its neighbours in terms of the *availability* of connectivity. Regarding the *availability of connectivity*, a trio of indicators provide perspective on the situation in Serbia:

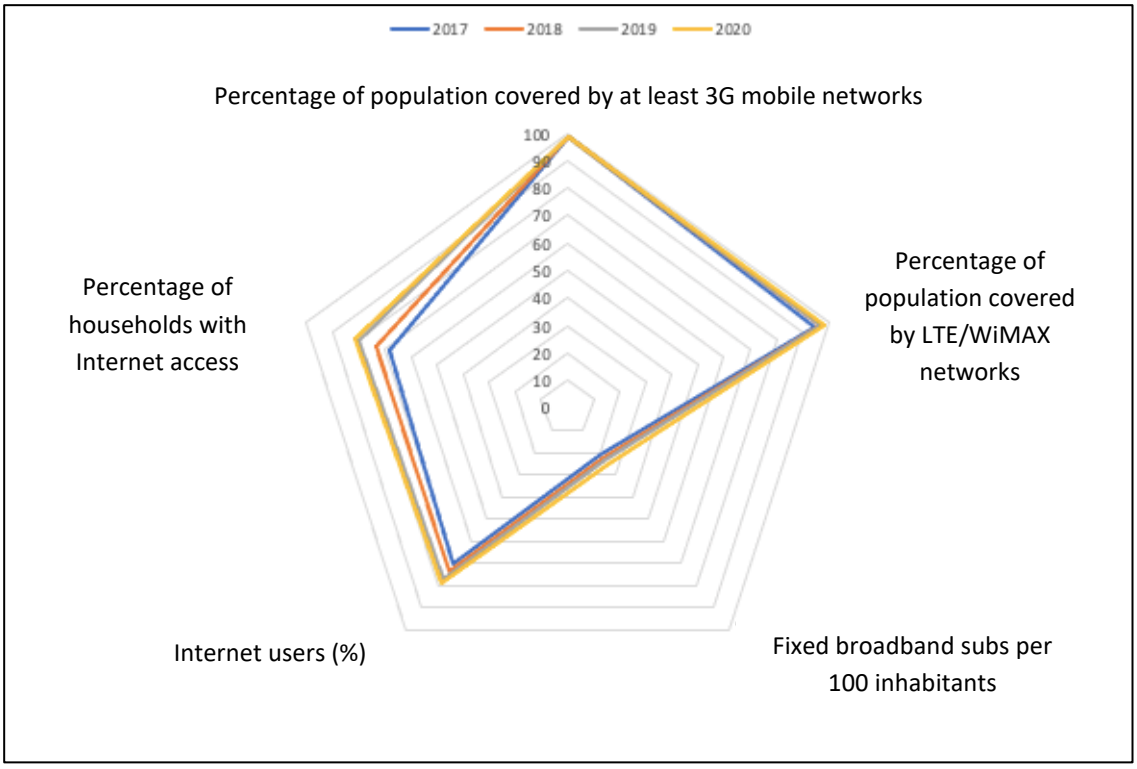
- Percentage of the population covered by at least an LTE/WiMAX mobile network: Serbia is fifth among the 9 countries featured in this report, as statistics from 2019 indicate a coverage rate of 96.9 per cent.[35] These estimates place it right behind Montenegro (97.7 per cent) and slightly ahead of Türkiye (96.7 per cent). There was not a significant jump between 2019and 2018.
- Estimated proportion of households with internet access at home: The report states that 80.9 per cent of the population has access to the internet in 2019.[36] This is an increase from data collected in 2018, which put the connectivity rate in the low 70 per cents. The country also leads the region

[35] The Status of Connectivity in 9 Non-EU Countries of Europe Region, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Meaningful%20Connectivity/Report%20-%20The%20Status%20of%20Connectivity%20in%209%20non-EU%20countries%20of%20Europe%20region_final_clean.pdf.
[36] The Status of Connectivity in 9 Non-EU Countries of Europe Region, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Meaningful%20Connectivity/Report%20-%20The%20Status%20of%20Connectivity%20in%209%20non-EU%20countries%20of%20Europe%20region_final_clean.pdf.

in terms of access, together with Türkiye in first position. However, they have not reached the EU's average of 86.6 per cent.[37]

Figure 3 below looks at basic indicators of ICT access in Serbia for theyears 2017, 2018, 2019, and 2020.

Figure 3. Basic indicators of ICT access and usage in Serbia[38]



2.1.4. Market Access

According to the ITU's *Measuring Information Society Report 2018*, Serbia's aspiration to join the EU has prompted the country to reform its telecommunications sector. For instance, officials in Belgrade took steps to end the monopoly held by Telekom Srbija with the passage of the Serbia Telecommunications Law in 2003.[39] The Republic Telecommunication Agency, now known as RATEL, was established to facilitate the process of liberalization in the field.[40] Ultimately, these measures not only spurred

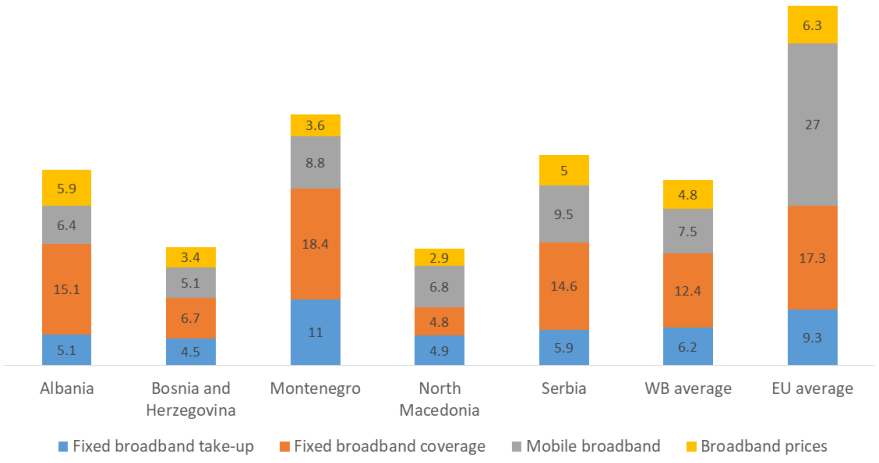
[37] For a list of countries who are part of the European Union (EU)-27, visit the following link: https://european-union.europa.eu/principles-countries-history/country-profiles_en.
[38] World Telecommunication/ICT Indicators Database 2023 – Retrieved July 2023, ITU (2023), https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx.
[39] Measuring the Information Society Report – Volume 2, ITU (2018), https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf.
[40] Measuring the Information Society Report – Volume 2, ITU (2018), https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf.

competition within the industry, but also expanded the menu of options available to citizens seeking telecommunication services.

While the market for these services is more diverse, it is still divvied up between a handful of companies. Telekom Srbija had nearly 45.6 per cent of total subscriptions at the end of 2017, more than any of their competitors at that time.[41]Telenor Serbia, a Czech-backed provider now known as Yettel Serbia, held 31 per cent of the market during the same period.[42]Finally, Vip Mobile, which has rebranded as A1 Srbija, came in third with 23.2 per cent of the market according to these estimates.[43] When it comes to the to the operator's share in the total revenue from mobile telephony, in 2021, no company had a significant advantage. Yettel is leading with 36.8%, Telekom Srbija is close with 35.3%, while A1 has 27.78%. Although the industry might be more diverse, it is undeniable that these businesses have enhanced connectivity throughout Serbia.

According to the DESI index (Digital Economy and Society Index)[44], the data for 2022 shows that Montenegro (35,1) and Serbia (34,9) have the highest scores among the Western Balkans DESI scores. They are followed by Albania (32), North Macedonia (27,4) and Bosnia and Herzegovina (23,3). The average score of DESI for the Western Balkan countries is of 29.7, while for the Europe region it is 52,3.

Figure 6. Connectivity sub-dimensions, WB DESI 2022[45]



[41] Measuring the Information Society Report – Volume 2, ITU (2018), https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf.
[42] Measuring the Information Society Report – Volume 2, ITU (2018), https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf.
[43] https://www.ratel.rs/uploads/documents/empire_plugin/636d49507a8c8.pdf
[44] Western Balkans Digital Economy Society Index, WB DESI 2022 Report (2022), https://www.rcc.int/pubs/159/western-balkans-digital-economy-society-index-wb-desi-2022-report.
[45] Western Balkans Digital Economy Society Index, WB DESI 2022 Report (2022), https://www.rcc.int/pubs/159/western-balkans-digital-economy-society-index-wb-desi-2022-report.

2.1.5. Trust and Security

According to the 2020 ITU Global Cybersecurity Index, Serbia is 39th out of 182 in the global rankings.[46] When looking at the European region, the country is place placed 25th out of 46 with a score of 89.8.[47] The index is a trusted reference that measures the commitment of countries to cybersecurity at a global level, raising awareness on the distinct dimensions of the complex issue. It highlights how Serbia excelled at creating robust legal and technical measures. However, it also noted that more attention should be paid towards capacity-building initiatives.

Over the years, the country has taken the initiative to improve the resilience of its e-infrastructure. It is party to the Budapest Convention on Cybercrime.[48]The Convention was signed in April 2005, ratified in April 2009, and entered into force in August 2009.[49] It is responsible for coordinating all policy related to cyber security, ensuring that citizens can safely navigate the internet. Its cyber security activities are defined by seven core principles:[50]

1. Information security is an integral part of overall security and is in the function of exercising and respecting the rights, freedoms and interests of citizens, the economy and the state;
2. Information security is important for all social factors using information and communication technologies, who need to be aware of the risks associated with the use of technology and to take preventative and other necessary protection measures;
3. Information security means timely identification of risks, taking preventive measures and effective reaction to incidents;
4. It is necessary to establish and improve the regular and efficient exchange of information on risks and incidents in the field of information security at the national and international level;
5. Continue the continuous development of the system of protection in information security at the legal, organisation and technical level, with adaptability to new circumstances and challenges;
6. Systematically raise awareness and improve knowledge and skills in all categories of citizens in terms of information security in everyday life and in the workplace;
7. Establish continuous cooperation between the public and private sector as a basis for the development and improvement of strategic priorities.

The information security is included in the Information Society and Information Security Development Strategy 2021–2026. The Strategy is aligned with the EU Network and Information Security Directive

[46] Global Cybersecurity Index, ITU (2020), https://www.itu.int/epublications/publication/D-STR-GCI.01-2021-HTM-E.
[47] Global Cybersecurity Index, ITU (2020), https://www.itu.int/epublications/publication/D-STR-GCI.01-2021-HTM-E.
[48] For a full list of participating countries, visit the College of Europe's website on the Budapest Convention: https://www.coe.int/en/web/cybercrime/the-budapest-convention.
[49] For more information, visit the following link: https://www.coe.int/en/web/conventions/full-list?module=signatures-by-treaty&treatynum=185.
[50]National Cybersecurity Strategies in Western Balkan Economies, Geneva Centre for Security Sector Governance (2021), https://www.dcaf.ch/national-cybersecurity-strategies-western-balkan-economies.

(NIS Directive)' which foresees the obligation to adopt a national strategy for information security that will define the strategic goals and priorities that relate to network and information security.

The importance of the development of the information society was recognized in the Republic of Serbia more than a decade ago, when the first Strategy for the Development of the Information Society in the Republic of Serbia until 2020 was adopted, which included all priority areas that contribute to the development of the information society, namely: electronic communications, e-government, e-health and e-justice, ICT in education, science and culture, electronic commerce, ICT business sector, information security. The Strategy clearly defined the principles upon which the development of information security in the Republic of Serbia is based on, as well as priority areas that include the security of information and communication systems, security of citizens when using technology, fight against high-tech crime and information security of the country.[51]

Information security, which as a topic was included in the Strategy for the Development of the Information Society, since gained tremendous importance. Due to the use of new technologies, the risks that arose as a result are perceived to grow and will continue growing. Accordingly, in 2017, the Government adopted the Information Security Development Strategy for the period from 2017 to 2020, which defined the principles of information security , priority areas and strategic goals related to the security of citizens, the economy and the state.

As the aforementioned strategies expired in 2020, at the initiative of the then Ministry of Trade, Tourism and Telecommunications, the drafting of the Strategy Proposal for the period from 2021 to 2026 was started, which would include the area of information society and information security, in order to ensure continuity in their development, and which would be adapted to the new circumstances that are a consequence of accelerated digitization and the development of new technologies in all segments of society.[52]

As reliance on digital technologies increases, so does the potential for crimes such as hacking, identity theft, financial fraud, and the distribution of illegal materials online. Hence, the country adopted Strategy for the Fight against High-Tech Crime for the period 2019-2023 which stipulates four specific goals in the field of high-tech crime, namely:

1. Improved and harmonized legislation of the Republic of Serbia with legal norms and standards of the European Union in the field of combating high-tech crime
2. Improved organizational, personnel, technical and operational capacity of the state authorities competent for suppression of high-tech crime
3. Improved preventive and proactive approach in the fight against high-tech crime

[51] Information Security Development Strategy until 2020 (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2010/51/2/reg
[52] Strategy for the Development of the Information Society 2021-2026 (Serbian) http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2021/86/1/reg

4. Improved cooperation at the national, regional and international level.[53]

Building Trust and Confidence in the Use of ICTs for Children and Youth

The country signed the Council of Europe Convention on the Protection of Children against Sexual Exploitation and Sexual Abuse ("the Lanzarote Convention") in October 2007.[54] Furthermore, they have been active members of the WePROTECT Global Alliance.[55] The initiative, which seeks to convene stakeholders across sectors, is dedicated to mitigating the damages of online child sexual exploitation. These show the commitment of the country to prevent this form of violence in the online space.

Stakeholders from all sectors have come together to develop safeguards which would allow children in Serbia to take advantage of the benefits provided through technology. The Contact Centre for Children's Safety on the Internet (i.e. "Contact Centre") is one of the main actor.[56] This education-focused department visits local schools to raise awareness on the multiple dangers found in the digital space. They also provide counselling services, prepare prevention strategies, and flag illegal content. The Contact Centre has considerable reach, as it was estimated that in 2017 they made 377 presentations to 133 primary schools attended by over 13,880 pupils.[57] At present, the organisation is committed to continue their work with parents and children.

In 2017, the Ministry of Information and Telecommunications established the "National Contact Centre for Child Online Protection" public helpline and web portal.[58] These two outlets were designed to enable concerned users to report inappropriate activities to the relevant authorities.[59] The Ministry then dispatches these reports to the website administrators and prosecutor's office. In situations where there might be a criminal offence, cases are referred to the Ministry of the Internal Affairs.[60]

The Ministry of Information and Telecommunications has also sponsored the IT Caravan, an educational campaign created to promote the useful, creative and secure use of information technologies.[61] The initiative is also the carrier of "Smart & Safe", a platform which prevents the benefits of using the internet

[53] Strategy for the fight against high-tech crime 2019-2023 (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2018/71/1/reg
[54] For more information on the convention, as well as its signatories, visit the following link: https://www.coe.int/en/web/conventions/full-list?module=signatures-by-treaty&treatynum=201.
[55] For a list of governments affiliated with the initiative, visit the following link: https://www.weprotect.org/alliance/governments/.
[56] For more information on the Contact Centre, visit the following link: https://www.srbija.gov.rs/tekst/en/129990/child-safety-on-the-internet.php.
[57] Status of national child online protection ecosystems in South Eastern Europe, ITU (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/FINAL%20REPORT.pdf.
[58] For more information, visit the following link: https://pametnoibezbedno.gov.rs/o-nama/.
[59] Status of national child online protection ecosystems in South Eastern Europe, ITU (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/FINAL%20REPORT.pdf.
[60] Status of national child online protection ecosystems in South Eastern Europe, ITU (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/FINAL%20REPORT.pdf.
[61] Status of national child online protection ecosystems in South Eastern Europe, ITU (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/FINAL%20REPORT.pdf.

for education, business, and communications along with the hazards that may be encountered in these fields.[62] Finally, the Ministry has launched a long-running media campaign for child online protection (COP) which airs on Radio Television Serbia.

Online platform "I protect you" enables a centralised approach to combating violence. It encompasses work of 7 ministries in one national online platform and improves access to information, training, as well as prevention and intervention tools. By integrating all aspects of prevention and tools for combating violence, it raises the capacity of children, teachers, parents through specifically designed free online training, as well as institutions to recognize and quickly address violence. Special emphasis is given to the digital violence, to raise awareness of it.[63]

Finally, there were a variety of activities regarding digital safety for children in 2019. A guide was created by UNICEF and Telenor, with the support of the Ministry of Science, Technological Development and Innovation and the Uzice Centre for Children's Rights, aiming to pinpoint the risks for children between the ages of 4 and 8 when using the internet.[64] Additionally, the Tijana Juric Foundation lobbied the government to increase sentences for individuals who have harmed children, including incidents that occurred on the internet. Reflecting on these developments, it is evident that there is momentum behind passing legislation which protects the wellbeing of youth both online and "off-line."

Through its COP Guidelines, ITU is supporting countries in Europe and beyond to adopt a strategic and holistic approach to child online protection that brings all components together at the country level, as well as to provide expert guidance on the various dimensions of COP, including for children, parents and educators, industry and policymakers.[65]

2.1.6. Resilience and Sustainability

Like many countries, Serbia has sought to put policies into place that will protect its networks for communication. ßIt has been prioritized by successive governments and is a major piece of the country's plan to gain admission into the EU. This larger goal of resilient infrastructure has featured prominently in policies developed by key officials, such as in the list below:[66]

- Strategy for the Development of Next Generation Networks by 2023 (Official Gazette of the Republic of Serbia No. 33/18): Establishes the over-arching goal of securing economic stability through investment in technological development, which also encompasses digital infrastructure;

[62]For an example of this program in action, visit the following link: https://arhiva.mtt.gov.rs/en/releases-and-announcements/smartsafe-it-caravan-in-krusevac/.
[63]more information on the guide, visit the following link: https://cuvamte.gov.rs/sta-je-nasilje/digitalno-nasilje/
[64]For more information on the guide, visit the following link: https://digitalni-vodic.ucpd.rs/.
[65] For more information, visit the following link: https://www.itu-cop-guidelines.com/.
[66] Information Society and Information Security Development Strategy of the Republic of Serbia for the Period 2021-2026 https://dig.watch/resource/strategy-for-the-development-of-information-society-and-security-in-the-republic-of-serbia-for-the-period-from-2021-to-2026

- Industrial Policy Strategy from 2021 to 2030 (Official Gazette of the Republic of Serbia No. 35/20): Outlines a larger vision for industrial development in the Balkan country, which may include the maintenance of communication networks;
- Cybercrime Strategy for the Period 2019-2023 (Official Gazette of the Republic of Serbia No. 71/18): Highlights the policy tools to combat crime in the virtual realm, such as cyber-attacks on digital infrastructure;
- National Security Strategy of the Republic of Serbia (Official Gazette of the Republic of Serbia No. 94/19): Underscores how leading actors should come together to combat potential threats across all areas of social life, which may also apply to the virtual space;
- Strategy for the Development of the Public Information System in the Republic of Serbia for the Period 2020-2025 (Official Gazette of the Republic of Serbia No. 30/18): Issues measures which would empower government officials to tackle security threats that emerge in an online environment like cyber attacks;
- Law on Information Security (Official Gazette of the Republic of Serbia No. 6/16, 94/17 and 77/19): Governs security measures that can be employed to eliminate security risks that would affect information and communication systems.

The central government has also prioritized broadband mapping in recent years. The Electronic Communications Law, which was ammended in 2023, designates the Regulatory Agency for Electronic Communications and Postal Services (RATEL) as responsible for this work.[67] In addition to maintaining a database with relevant geospatial information, it was also tasked with handling public information requests. Finally, in accordance with the law, RATEL published a rulebook in 2015 that outlined the methods for collecting and publishing information related to the capacities of in-country networks. The document also mandated that the organization create a GIS Web application by 2016, which came into operation in July of that year.

Requirements outlined in the law guided efforts to establish an infrastructure mapping system that aimed to optimize infrastructure throughout the country. This, in turn, would help facilitate the planning of next generation networks (NGNs) in a manner that prioritized competitiveness and efficiency.[68] The data collected for this initiative was based on four main criteria including (i) type (e.g. cables, other ground pieces of equipment, antenna towers, masts), (ii) availability, (iii) geographic location, (iv) for shared use/access only. An example of the information gathered by RATEL can be seen below:

- Name of operator (owner)/location/route;
- WBS84 coordinates of important points (start/end, hub);

[67] Broadband Mapping Systems in Europe and Regional Harmonization Initiatives, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/RRF/21-01-15%20Background%20Paper_Broadband%20Mapping%20Systems%20in%20Europe%20and%20Regional%20Harmonization%20Initiatives_final_clean.pdf.

[68] For more information, review this 2016 presentation prepared by RATEL officials at the following link: https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2016/Broadband%20Mapping/3.%20Ivkovic%20Measuring%20QoS%20and%20Mapping%20of%20Shared%20Infrastructure%209%2004%202016.pdf.

- Cable type and route length/geodetic record;
- Other information (type of pipes/number of pipes on the route/manhole type/number of manholes on the route);
- Capacity for lease/unused capacity;
- Cable instalments and ending data.

While the GIS Web application is online, it is only accessible to operators and employees of RATEL. The database has evolved to become a "clearinghouse" for information related to networks across the country. As of 2019, the resource provided the following figures:[69]

- 30 registered operators (180 in total);
- 1,500 antenna towers/masts;
- 1,500 fibre optic cables;
- 200,000 other cable elements;
- 7,000 database access/year.

Lastly, a variety of agencies and departments collaborate to strengthen the security of this infrastructure. As cited in previous sections, RATEL helps coordinate policy related to electronic communications. This line of work often brings the entity into contact with Telekom Srbija, a provider who has taken the lead in improving the quality of these services. At the local level, the Ministry of Public Administration and Local Self-Government engage with these aforementioned actors, relying on their technical expertise to reduce potential vulnerabilities in their service delivery models. While these are far from the only entities whose mandates include infrastructure, the stakeholders cited above play a major role in shaping national telecommunications policy.

2.1.7. Financing and Investments

The Government of Serbia has made a concerted effort to attract outside investors, recognizing Serbia's potential to be a "tech hub".[70] Belgrade has sought to attract groups interested in e-government, purchasing their products and solutions designed to make administration more efficient.[71] For instance, it has increased investment into the industry by increasing support for entrepreneurs and creatives, signalling to others that the field is a priority.[72] The country has also made efforts, like offering incentive

[69] Broadband Mapping Systems in Europe and Regional Harmonization Initiatives, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/RRF/21-01-15%20Background%20Paper_Broadband%20Mapping%20Systems%20in%20Europe%20and%20Regional%20Harmonization%20Initiatives_final_clean.pdf.
[70] Guide for investing in Serbia, Deloitte (2022), https://www2.deloitte.com/rs/en/pages/tax/articles/guide-for-investing-in-serbia.html.
[71] Serbia – Country Commercial Guide, International Trade Administration (2022), https://www.trade.gov/country-commercial-guides/serbia-market-opportunities.
[72] How Serbia plans to transition to a digital economy, ITU (2020), https://www.itu.int/hub/2020/05/how-serbia-plans-to-transition-to-a-digital-economy/.

packages and reducing operating costs, to attract foreign stake holders in the high-tech sector which can take advantage of a growing workforce that currently consists of nearly 45,000 individuals.[73] Finally, the Government promoted the country as a leader in the field of med-tech, in particular in the imaging equipment sectors.[74] Foreign companies that have set up a base of operations in the Serbian market include Microsoft, IBM, and Intel.[75]

The Innovation Fund of the Republic of Serbia is the key state institution supporting innovative activities and managing funding for stimulating innovation. The Fund's mission is to support innovation development through appropriate financial, technical, and advisory support instruments. It aims to empower innovative enterprises and strengthen the link between research and development and the business sector. Since 2011, through the Innovation Fund, 79.8M euros have been approved for a total of 1728 projects, innovation vouchers and support in technology transfer valued over 120M euros. More than 5,430 applications for projects were submitted to all public calls.[76]

2.2. Building Block 2: Adoption

Fully unpacking the use of ICTs by various groups in society allows for a more informed understanding of the digital divide, offering insight into which policy interventions can guarantee equitable access. This requires a closer look at the many dimensions of digital inclusion, including i) measures designed to increase the affordability of digital services; ii) interventions created to enhance the skills of individuals; and iii) proposals that extend access to ICTs for all in Serbia.

2.2.1. Affordability

To ensure that access to connectivity is meaningful, there is a need for such connectivity to be affordable, to ensure that connectivity is inclusive and accessible to all people. *Access* and *affordability* are, as a result, the strongest determinants of a third factor of connectivity, *uptake*.

According to the ITU Report on *The Status of Connectivity in 9 Non-EU Countries of Europe Region* (2021),from an *affordability* standpoint, in 2021, the mobile-data basket cost was around 1.5 percent of gross national income (GNI) per capita for an allowance of 2 gigabytes (GB), compared to the 0.5 percent

[73] For more information on how the government has prioritised this sector, visit the following link: https://innovations.serbiacreates.rs/.
[74] Serbia – Country Commercial Guide, International Trade Administration (2022), https://www.trade.gov/country-commercial-guides/serbia-market-opportunities.
[75] Serbia – Country Commercial Guide, International Trade Administration (2022), https://www.trade.gov/country-commercial-guides/serbia-information-and-communications-technology-market.
[76] For more information, visit the following link: https://www.inovacionifond.rs/lat/o-fondu/rezultati

average seen at the European level.[77] Meanwhile, the cost of fixed broadband was approximately 2.7 percent of GNI per capita, while the rate in Europe hovered around 1.3 percent per capita.[78]On this point, Serbia is above the 2 percent GNI per capita monthly mark set by the Broadband Commission as a threshold for availability. Affordability of connectivity thus remain a challenge in Serbia and reducing costs must be prioritized to ensure meaningful internet access.

Finally, regarding the *connectivity uptake*, Serbia has seen limited success:

- Fixed broadband subscriptions per 100 inhabitants: According to information released in 2022, Serbia has 26.2 subscriptions per 100 inhabitants. The country is on top of the pack compared to regional peers, being placed higher than Türkiye (22.3) and North Macedonia (24.2). Serbia is also behind the EU-27 average of 35.4 subscriptions per 100 inhabitants.
- Active mobile-broadband subscriptions per 100 inhabitants: The country has around 104 subscriptions per 100 inhabitants in 2022, which is an increase compared to around 66 subscriptions back in 2018. Even so, it remains behind the EU-27 average of 108.8 subscriptions per 100 inhabitants, and stands in the middle of the group compared to other non-EU countries of the region.
- Estimated proportion of households with a computer: Serbia stands out among its regional peers, with nearly 78 percent of households having access to a computer. The nearest country is Bosnia and Herzegovina, with only 61 percent of homes being connected. Yet, Serbia still lags behind the EU-27 average of 80.5 percent.
- Proportion of individuals who used a computer (from any location) in the last 12 months and internet users (as percent of the population): The country does not have information for 2019. However, in 2018, 72 percent of the population have used a computer in the past calendar year, making Serbia ahead of all other countries for the same year.[79]

2.2.2. Skills

Serbia has an international reputation for 21st-century technical skills, a key enabler of digital innovation. IT education begins early in elementary schools with a compulsory coding curriculum. The country is ranked 20th for graduates in engineering and science.[80] Most stakeholders agree a significant challenge is increasing capacity as the ecosystem grows, which the higher education sector cannot achieve alone.

Policymakers in Serbia have proposed several strategies designed to equip citizens with the skills they will need to succeed in the information society. In 2012, the government adopted a Strategy for Education

[77] ICT Price Baskets (IPB), ITU (2021), https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx.
[78] ICT Price Baskets (IPB), ITU (2021), https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx.
[79] Countries that included information from 2018 are as follows: Bosnia and Herzegovina, Georgia, Montenegro, and Turkey.
[80] Global Innovation Index 2023 https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023-en-main-report-global-innovation-index-2023-16th-edition.pdf

Development up to 2030, focusing on developing students' competencies required at school and in the workplace.[81] The document not only described how education could be used to enhance the experience in the classroom; it also shed light on the value of connecting schools to the internet across the country. The action plan featured a list of strategic targets related to these aforementioned goals, highlighting the efforts made to transform the educational sector:

- Increasing the quality of educational processes and outcomes to the maximum attainable level;
- Increasing population coverage at all educational levels;
- Achieving and maintaining the relevance of education and aligning the education system's structure with the needs of individuals and those of the economic, social, cultural, research, education, public, administrative and other systems;
- Increasing overall effectiveness in the use of educational resources.

In 2021, a follow-up plan, the Strategy for Educational Development in the Republic of Serbia up to 2030, built on the previous framework.[82]This guiding document focused on pre-university education, with the objective to improve the digital competencies of younger students and school educators. It also outlined the support that administrators would receive to organize e-learning activities.In this regard, the strategy includes goals and objectives that are relevant to the integration of ICTs into the classroom:

Goal 1: Increased quality of teaching and learning, equity and accessibility of pre-university education and upbringing and strengthened educational function of educational institutions

- Specific Objective 1.1 – Improved teaching and learning in pre-university education and training: This target describes the need to improve experiences in the classroom, which may lead to the incorporation of learning technologies;
- Specific Objective 1.3 – Establish foundations for the development of digital education at pre-university level: This target highlights the importance of not only increasing the digital literacy of teachers and students, but also describes the value of integrating digital technologies into pedagogical practices;
- Specific Objective 1.4 – Improved accessibility, equity and openness of pre-university education and training: This target underscores the need to help students who face obstacles when trying to receive an education, a goal that could be reached through the use of e-learning technologies;
- Specific Objective 1.6 – Improved quality of the continuous professional development system for teachers, educators and professional associates: This goal emphasizes the value of long-term training for local educators, components of which may revolve around the use of digital technologies in the learning environment.

[81] Strategy for Education Development up to 2030 (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2021/63/1/reg

[82] For more information on this strategy, visit the following link: https://www.mpn.gov.rs/wp-content/uploads/2021/02/1-SROVRS-2030_MASTER_0402_V1.pdf (Serbian).

- Specific Objective 1.8 – Improved conditions for lifelong learning: This target describes how officials could take advantage of innovations, including those in technology, to ensure that learners of all backgrounds and ages are supported in Serbia;
- Specific Objective 1.9 – Improved infrastructure and network of institutions in pre-university education: This target outlines how schools should be equipped with the resources, and technology, needed to ensure all students receive a quality education.

Goal 2: Increased quality and improved relevance and equity of higher education

- Specific Objective 2.2 – Improved relevance of higher education at the national and international level: This target notes how offerings for education must be tailored to the state of the economy, especially the growth of industries related to ICTs;
- Special Objective 2.3 – Improve inclusion and equity in higher education: This target calls for changes to be made so that students of all backgrounds and abilities can receive an education, a goal that could benefit from the use of educational technologies;
- Special Objective 2.4 – Digitalization of higher education: This target lists a series of policies which could be implemented to guarantee that Serbian students receive a "21st-century education".

Through these various activities, it has become clear that digital education is a priority area for leading policymakers. It is worth noting that the government has also cooperated with the EU to develop an action plan for digital skill development. Additionally, the country has created its own strategy, the Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024, which outlines the competencies that will be required to succeed in the digital economy.[83] These core competencies have been integrated into the mainline curricula of secondary schools, and national testing was first piloted in 2017.[84] In fact, Serbia is one of four countries in Europe to test pupils on digital literacy as part of its larger quality assurance program.

Serbia is also one of the few educational systems in Europe that has a specific framework for digital skill-building training for teachers. The Digital Competence Framework – Teacher for the Digital Age, managed by the Ministry of Science, Technological Development and Innovation, placed emphasis on how technologies can be used to enhance the educational experience.[85] It also strives to ensure that ICTs are used in a manner that is deliberate, flexible and safe for students, allowing them to grow as learners in an

[83]For more information about this strategy, as well as its implications for the education system, visit the following link: https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Digital%20skills/4_Nevena%20Praizovic_Serbia.pdf.

[84]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.

[85] For more information on this framework, visit the following link: https://www.mpn.gov.rs/wp-content/uploads/2017/04/Okvir-digitalnih-kompetencija-Final-1.pdf (Serbian).

online and "off-line" environment.[86] Many of these changes were reflected in the new Strategy for Educational Development in the Republic of Serbia which was passed in 2021.

The COVID crisis shed light on the necessity of this strategy, as students and teachers were forced to develop skills needed to navigate the "new normal" of distance learning. During the early stages of the pandemic, the government launched a centralized website containing information on educational activities for elementary and secondary students.[87]Other initiatives put in place to support students during this period of uncertainty included:

- Broadcasting specially prepared and adapted educational content for primary school students on the RTS 2 and RTS 3 television channels of the country's public broadcasting service, Radio-televizija Srbije (RTS), as well as in local media in the languages of national minorities;
- Establishing a repository of educational video content for primary and secondary school students on the free RTS application "My school" for mobile phones, on the RTS website and on the multimedia internet platform RTS Planet;
- Making a set of tools available for online communication between students and teachers.

Lastly, UNICEF has partnered with the Ministry of Science, Technological Development and Innovation on projects relating to the training of teachers, helping educators across the country become familiar with the tools of e-learning.[88] UNICEF has also collaborated with the Institute for the Improvement of Education to strengthen national training in teachers' digital competencies. A web portal was also jointly created, providing guidance to teachers on how to prepare materials for e-learning, as well as offering a space to connect with other educators to share tips and advice.[89]By the end of 2020, it was estimated that nearly 41,500 teachers had participated in these activities.

Established in 2017, The Startup Center (SC) at the University of Belgrade's Faculty of Economics was one of a few programmes for developing entrepreneurial thinking and behaviour among students in Serbia. However, more programmes have been launched in the last year, including the University of Belgrade business accelerator "Universe project". In addition, the Faculty of Organizational Sciences in cooperation with the Digital Serbia Initiative and partners (Startit, Nova Iskra, and PwC), and with the support of USAID, has started the project "Take the idea". Academic Institutions are beginning to understand their role in creating and motivating future innovators. It appears there is a disconnect between industry and academia, and private sector needs are not understood. Apart from a couple of faculties, there seems to be little collaboration. The private sector needs to work in partnership with academia to produce research that identifies real problems. In addition, there does not appear to be a clear framework to support start-ups based on basic research, so entrepreneurs fail to commercialise research on a large scale. One challenge for universities is a lack of funding for academics. Skilled experts are incentivized to work for a

[86] For more information on this approach to pedagogy, visit the following link: https://www.uhr.se/globalassets/_uhr.se/internationellt/eurydike/digital-education-at-schools-in-europe_eurydice-report.pdf.
[87] For more information about this initiative, visit the following link: https://www.rasporednastave.gov.rs/ (Serbian).
[88] Connectivity in education: Status and recent developments in nine non-European Union countries, ITU-UNICEF (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf.
[89] For information on the portal, visit the following link: https://www.portal.edu.rs/podrska/.

company, rather than become professors or teachers. Often assistant professors lack real-world industry experience compounding the issues. There are some multidisciplinary studies, however, not a large pool of graduates are leaving universities with the skills needed by innovative firms. To play its part in the development of the ecosystem, academia needs to develop strategic, long-term partnerships to drive academia-industry linkages through research activities or technology transfer.

When it comes to the public sector, most public servants lack an understanding of emerging technologies such as Artificial Intelligence and Machine Learning, Blockchain, metaverse, robots, and drones, but also concepts such as digital economy. To understand how best to use digital tools for their job and also for better designing and implementation of public policies, the Government recognized that it is necessary for them to gain knowledge about disruptive technologies. Furthermore, private sector employees require the same skills to better utilize the technologies of the fourth industrial revolution to boost the economy. The training Fourth Industrial Revolution: New Technologies is being offered for free through the National Academy for Public Administration and the Chamber of Commerce and Industry's learning platforms. It is accessible to all civil servants and companies and is customized to people with little or no previous knowledge in the field, with lots of up-to-date examples of application. By understanding how the world has changed, officials will better understand all the benefits and risks associated with new technologies and thus create better policies that will encourage innovation.

State-of-the-art online self-paced training is packed with interactive content and divided into 7 modules: Artificial Intelligence and Machine Learning, Blockchain, Internet of Things, Robots and Drones, 3D Printing, Virtual and Mixed Reality and Digital Economy. Through gamification and quizzes, participants learn and test their knowledge. The latest applications of the technologies are presented in a series of videos from across the world.

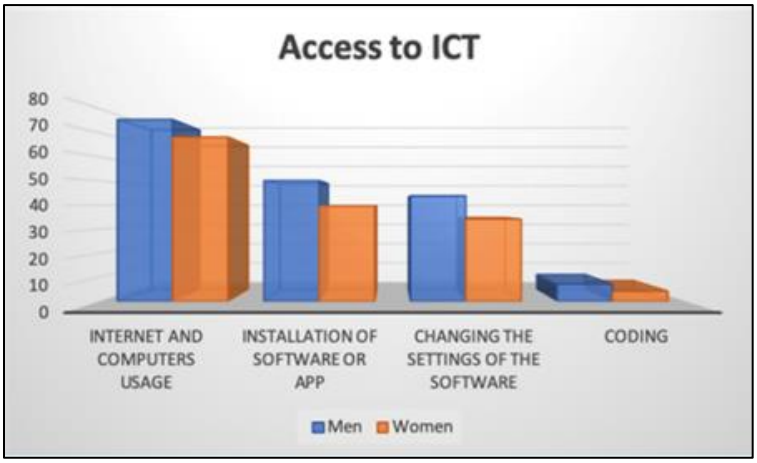
Furthermore, the Digital Expedition program is a caravan of digital skills, literacy and security. It visits cities around the country to raise citizens' awareness of the importance of digital skills and digital literacy through a series of workshops on the topic of electronic identity, i.e. who is an eCitizen, electronic services, safe use of the Internet, the importance and understanding of personal data, the creation and marketing of digital content. The program is an initiative of the Prime Minister's Office and in partnership with the UNDP, USAID and with the support of the Ministry of Information and Telecommunications, the Ministry of Labour, Employment, Veterans and Social Affairs, the Office for IT and eGovernment.

2.2.3. Inclusion

Bridging the Gendered Digital Divide

According to a 2021 ITU and UN Women report, statistics show that while women are less likely to use computers compared to men, they spend their time on the internet in similar ways, with, for example, making digital payments and accessing online banking.[90]

Figure 4. Access to ICT between men and women

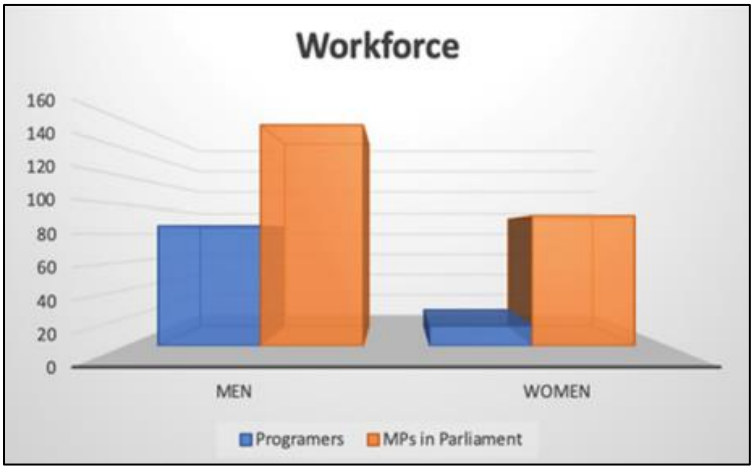


When it comes to the ICT sector, Serbia has an open, inclusive society, and women are represented in the ICT sector. Female entrepreneurs lead several significant and successful start-ups but are still relatively rare. In government and the corporate sector, women are active in leadership positions. Sixty per cent of recent graduates are women, but they are not all making their way into the digital innovation ecosystem. The ecosystem is aware of this issue, and several programmes encourage women entrepreneurs and start-ups in digital media and tech. The UN Women in Serbia supports various initiatives to encourage more girls to use innovation and technology to solve regional and global problems. More programmes, role models, and mentors could help to boost female entrepreneurship.[91] Overall, female participation is higher in other sectors, with women occupying position at all levels of government in the country. There is a greater degree of female participation in Serbia's public sector compared to the rest of the Western Balkans. In 2021, 93 of the 250 deputies in Parliament were women.

Figure 5. Workforce representation along gender lines

[90]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.

[91] Digital Innovation Profile (2022), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2022/Digital%20Innovation%20Profile%20Republic%20of%20Serbia.pdf



As for ICT education, at the national level, female students are interested in highly-technical fields. Although women account for more than half of all higher-studies graduates, they are outnumbered in the working field in disciplines like engineering and manufacturing.[92] Research on this subject has shown that this trend may be due to a lack of training opportunities. ITU and UN Women have pointed out that there is a gender gap in digital skill-building activities within the working population.[93]

In response, the government has taken action to address these disparities. Serbia was the first non-EU country to participate in UN Women's Gender Equality Index.[94]Statistics have shown that the number of women in ICT has increased. It is estimated that 27 per cent of women are enrolled in programs for computer science, higher than the EU average of 18 per cent. However, the field is still largely male-dominated, underscoring the need to ensure the meaningful participation of women in this prominent sector.[95]

Dark side of ICT and cyberviolence

Violence against women, both online and offline, remains an issue in Serbia. Approximately 54.31 per cent of participants in a recent survey say that they have experienced violence while being online, which mainly

[92]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.
[93]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.
[94]For more information about this document, as well as how the country performed in 2021, visit the following link: https://serbia.un.org/sites/default/files/2021-10/Gender%20Equality%20Index%20for%20Serbia%202021.pdf.
[95]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.

consisted of harassment and threats against their wellbeing.[96] While progress has been made to increase equity in society, the media has played a role in amplifying stereotypes which hinder the participation of women and girls in the digital space.

According to the data of the Ministry of Interior, which is stated in the Strategy for the Protection against Domestic Violence and other Forms of Gender-Based Violence 2021-2025, the perpetrators of violence in an average of 82% of cases are men. On the other hand, in an average of 70% of cases, the victims of violence are women.

The information highlighted in the Strategy indicates that a total of 85,355 cases of violence were reported to the police in the period of the previous Strategy 2017-2020, and that during 2020, police officers issued 29,540 emergency protection measures introduced by the Law on Prevention of Domestic Violence, of which approximately 70 percent of cases, a temporary ban was imposed on the perpetrator to contact and approach the victim of violence.

According to the data of the Ministry of Justice, in the period June 2017 - December 2020, basic public prosecutor's offices, after evaluating the risk assessment, submitted a total of 64,402 proposals for the extension of emergency measures, of which the basic courts adopted 63,033 proposals (97.87%). From September 2018 to December 2020, basic courts extended the emergency measure to protect minor victims in 2,534 cases. In the same period, coordination and cooperation groups held a total of 9,756 meetings where they discussed 173,720 cases, based on which 54,342 protection and support plans were drawn up (31.28% of cases considered).

Despite significant legal and institutional steps towards preventing and suppressing domestic violence in Serbia, continuous efforts are needed to reduce the tolerance and justification of violence that is still present in society and affects the decision to report violence.

While further actions are needed by the government to overcome these challenges, it is also important to consider the past efforts put in place to support women in Serbia. Over the years, a number of policies and strategies addressing inequalities and cyber violence have been implemented. The following list contains examples of such policy actions:[97]

- Strategy for the Protection against Domestic Violence and other Forms of Gender-Based Violence 2021-2025: Seeks to raise public awareness on the scope and consequences of gender-based violence in its various forms, as well as outline policy remedies to mitigate its myriad harms;[98]

[96]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.

[97] For a list of interventions implemented in Serbia, visit UN Women's Global Database on Violence against Women at the following link: https://evaw-global-database.unwomen.org/es/countries/europe/serbia.

[98] Strategy for the Protection against Domestic Violence and other Forms of Gender-Based Violence 2021-2025 (Serbian): https://www.minrzs.gov.rs/sr/dokumenti/ostalo/sektor-za-socijalnu-zastitu/strategija-za-sprecavanje-i-borbu-protiv-rodno-zasnovanog-nasilja-prema-zenama-i-nasilja-u-porodici-za-period-2021-2025-godine

- National Strategy for Gender Equality (2021-2030): Identifies avenues for action to eliminate the harms caused by violence against women in all its forms;[99]
- National Action Plan for the Implementation of UN Security Council Resolution 1325 – Women, Peace and Security in the Republic of Serbia (2017-2020): Highlights how the security sector in Serbia can be more attuned to the needs and priorities of women, especially the threats of violence that they may face.[100]

Good practices in informal ICT education

There are a number of activities which seek to engage women and girls interested in the ICT sector. One example is Girls in ICT Day, an annual event designed to provide role models for future entrepreneurs curious about this every-growing industry.[101] The long-running celebration was held for the eleventh time in 2021. Efforts have also been made to provide girls and young women interested in an ICT career with the skills they need to succeed. For example, the country has a national branch of the Women in Tech Network, a multi-national initiative that provides professional support and mentorship opportunities for interested participants.[102]

Ministries have also become more involved in encouraging female participation in the ICT sector. The Ministry of Information and Telecommunications led the Digital Serbia project dedicated towards improving e-infrastructure in educational, science, and cultural institutions.[103] The Ministry also manages the "Smart and Safe" platform which seeks to increase citizen engagement in the educational sector and digital economy.[104]In addition to running tech-related projects, and tackling topics like digital literacy and skill-building programs, the platform offers helpful tips related to online safety. Since 2017, the Office for IT and eGovernment in cooperation with the United Nations Development Program (UNDP) organizes Retraining for IT.[105] The program is free and selected participants learn the Java Script, PHP, Python, Java, .NET and System Administration.

Serbia celebrates Girls in ICT Day and has a chapter of Women in Tech. As a part of a bigger project known as Digital Serbia, the Ministry of Trade, Tourism and Telecommunications has launched a digital school

[99] National Strategy for Gender Equality 2021-2030 (Serbian) https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2021/103/1
[100] For more information on this strategy, visit the following link: https://www.peacewomen.org/sites/default/files/Serbia_NAP.pdf.
[101] For more information on the 2021 event, visit the following link: https://www.itu.int/net4/ITU-D/CDS/gq/GICT2021/display.daasp?ProjectID=1374&Quest=56638.
[102]For more information about the chapter, visit the following link: https://www.womentech.net/en-us/in/Serbia.
[103]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.
[104]Digitally empowered Generation Equality: Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries, ITU and UN Women (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf.
[105] For more information about the Retraining for IT, visit the following link https://itobuke.rs/

project for primary schools. The recently launched initiative to develop ICT infrastructure in education, science and cultural institutions is in the process of connecting all schools in the country to the Academic Network. The Smart and Safe platform, presented by the Ministry of Trade, Tourism and Telecommunications, is designed to raise awareness of the importance of citizen engagement with the education system and the greater digital economy. The platform creates educational and promotional projects to support digital literacy, digital competences and digital security culture throughout society. In line with regulations governing the protection and safety of children using new technology, the Ministry of Trade, Tourism and Telecommunications has also established a centre to offer advice, help, information and research to children, parents, teachers and other relevant individuals with regard to online safety. Problems can also be officially reported at the centre.[106]

ICT and Digital Accessibility for Persons with Disabilities

The 2021 ITU study on the assessment of digital accessibility policies in Serbia, run in collaboration with the Government of Serbia, noted that persons with disabilities faced difficulties when trying to make use of e-services offered by the state.[107] These systems, which rely on a "medicalized" – and thus generic - definition of accessibility, may not be accommodating of all types of disability.[108] Outside of the public sector, numerous interviewees selected for this assessment noted that there were significant factors preventing them from securing full-time employment in the private sector. From inaccessible workplace environments to insufficient care allowances, the lack of long-term support may dissuade certain individuals from working in this sector.[109]Provisions need to be in place to ensure that the digital society and economy benefits extend to all in the country.

Based on th findings of the ITU Study, digital accessibility has been prioritized on the highest level. A specific GovTech team for empowering people with disabilities in the Office of the Prime Minister is lead by the Prime Minister herself with the aim of leveraging digital technology for strengthening social inclusion. The team enables a direct two-way line of communication between people with disabilities and the Prime Minister. By approaching this topic on such a high level, the public sees inclusion as a priority which allows for a more effective and joint efforts from all across society. Engaging users with disabilities in the designing of digital tools results in higher-quality, more reliable accessibility solutions that meet their actual needs and expectations. Furthermore, as new technologies continue to evolve, prioritizing accessibility ensures that digital services remain accessible as new platforms and technologies emerge, future-proofing the government's digital presence. In the past 3 years, four digital solutions have been

[106] https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-EQUAL.01-2021-PDF-E.pdf
[107]ITU study on the assessment of digital accessibility policies in Serbia, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/D-PHCB-ICT_ACCESS_SRB.01-2021-PDF-E.pdf.
[108]ITU study on the assessment of digital accessibility policies in Serbia, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/D-PHCB-ICT_ACCESS_SRB.01-2021-PDF-E.pdf.
[109]ITU study on the assessment of digital accessibility policies in Serbia, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/D-PHCB-ICT_ACCESS_SRB.01-2021-PDF-E.pdf.

developed that significantly impacted the quality of life and social inclusion of people with disabilities: eParking for People with Disabilities, SOS for deaf app, SignAvatar for sign language interpretation and Digital Textbooks in Serbian Sign Language introduced in the formal educational system.

In 2021, the team coordinated the successful implementation of the first digital service in Serbia designed exclusively for people with disabilities. Rather than spending hours in the cold month of December to gather and submit dozens of documents to prove their eligibility, people with disabilities can now simply apply online and receive the free parking permit at their doorstep. A nationwide application makes the service simple and intuitive, while all data is obtained electronically within the institutions. Bureaucratic obstacles were overcome through innovative design of the service and active involvement of service users and providers to achieve successful implementation. In Serbia, parking falls under the authority of the local government, so it was always up to the specific local government to invest and design the service. Since Prime Minister's Office was leading this initiative, it was a nationwide effort, meaning that people with disabilities who live in one of 51 cities and municipalities are able to apply online and receive the permit at their address. Furthermore, the Government successfully initiated the amendment of the legislation to double the fine for parking in the spots reserved for people with disabilities. Previously, people refrained from obtaining these permits and thus from moving around. Now, more people are applying and thus enjoying a more socially active life.

The "SOS for the Deaf" app launched in 2022 is a video relay that allows over 18,000 deaf people who speak Serbian Sign Language to make audio phone calls with hearing people. Through the app, the deaf person starts a video call with a sign language interpreter, who calls the desired phone number and then simultaneously translates the conversation between the deaf person and the called contact. This way, for the first time ever, deaf people can access emergency services, as well as book doctor's appointments, have job interviews or speak with any person or institution of their choice. The app is completely free to use and all telecom operators have enabled free unlimited internet data for usage of the app.

As another example, through collaboration between the public sector and the startup community, SignAvatar technology was implemented in the largest train station in the country. This Serbian startup is developing an avatar that uses sign language to automatically translate public address system announcements to sign language. In the next phase of the project, the SignAvatar system will be introduced in all train stations, airports and public transportation. Then, the system will be adapted to be used outside of the transport sector in other fields where real-time sign language interpretation is necessary, such as health, culture, etc.

Another important innovation was the introduction of Serbian language textbooks in Serbian Sign Language. The textbooks which were never introduced before are in a completely digital format, which means that every concept, song or story written in Serbian is accompanied by videos in Serbian Sign Language. Thus, for the first time in history, in the formal education system of Serbia, textbooks in Serbian Sign Language were introduced. These textbooks are a way to bridge the gap between traditional educational materials and the unique needs of deaf students, thus playing an essential role in creating an inclusive learning environment.

Aside from these initiatives, the Serbian Government as a whole has comprehensively worked on bridging the digital divide, specifically for people with disabilities. The Government has worked closely with the Committee on the Rights of Persons with Disabilities, an entity responsible for monitoring the compliance of states party to the Convention on the Rights of Persons with Disabilities (CRPD).[110] In 2016, the Committee issued its concluding observations, applauding Serbia for its achievements while highlighting areas of improvement such as:[111]

- Developing a comprehensive accessibility plan and roadmap to remove barriers and promote accessible information and social media;
- Setting specific targets in the Action Plan for Inclusive Education 2016-2020;
- Taking measures to ensure that elections are inclusive and accessible to all persons with disabilities including accessibility of voting facilities and campaign materials and content;
- Ensuring that organisations for persons with disabilities are involved in monitoring implementation of the Convention in Serbia.

Additionally, Serbia has created a legislative framework that promotes digital inclusion for persons with disabilities, much of which is aligned with key principles in the Convention agreement:[112]

- 2013: Adopted strategy and action plan for the prevention of and protection from discrimination (2014-2018);
- 2015: Enacted the Law on the Use of Sign Language recognizing the right to use sign language in procedures before state authorities;
- 2015; Included questions pertaining to persons with disabilities in national census form, a key step towards obtaining relevant data in the future;
- 2016: Amended the Law on the Prevention of Discrimination against Persons with Disabilities guaranteeing the right of persons with disabilities, especially those who are blind or visually impaired, to use personal facsimile stamps to sign legal documents;
- 2023 : Amended the law on Electronic Communications, which was enacted in 2010 and revised three times before in 2012, 2014 and 2018, to include a number of provisions that focus on promoting the interests of citizens through the provision of accessible services. This includes enabling access to high-capacity networks, transparency of prices and terms of use of public electronic communication services, as well as addressing the needs of special social groups. It is specifically pointed out that the law requires operators to address the needs of persons with disabilities, the elderly and those with special social needs, providing them with choice and equal access to services and applications.

[110]Serbia ratified the Convention on the Rights of Persons with Disabilities, along with its option protocol, in 2009.
[111]Concluding observations on the initial report of Serbia, Committee on the Rights of Persons with Disabilities (2016), https://tbinternet.ohchr.org/_layouts/15/treatybodyexternal/Download.aspx?symbolno=CRPD%2fC%2fSRB%2fCO%2f1&Lang=en.
[112]ITU study on the assessment of digital accessibility policies in Serbia, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/D-PHCB-ICT_ACCESS_SRB.01-2021-PDF-E.pdf.

2018: Enacted the Law on Electronic Government, which includes a line stating that e-government services must be offered to persons with disabilities without "technical, audio-visual, semantic and linguistic restrictions." Provisions include obliging entities to respect standards for accessibility, when designing, developing, maintaining and updating sites for e-government services; as well as to ensure that content found on websites is accessible on mobile devices, highlighting its benefit to persons with disabilities. Furthemore, the government is obliged to provide access to the content and services of e-government to everyone in accordance with standards for accessibility.

- 2018: Issued "Decree on detailed conditions for creating and maintaining a government body website," laying out how agencies should promote their services in the digital space. In the Decree, the government is obliged to ensure that their sites are accessible to all users, as well to assess its websites to see if they are compliant with standards for accessibility, placing the responsibility on the Office for IT and eGovernment to update the Government on an annual basis.[113]
- 2020: Adopted the "Strategy for improving the situation of persons with disabilities in the Republic of Serbia for the period 2020-2024," which lists how information, communications, and services intended for the public can adapt to the needs of persons with disabilities.[114]

The Government of Serbia has also sought to raise awareness on the need for digital inclusion and ICT accessibility, which are seen as two of the major impediments to improving the situation in the country:

- In 2020, the Ministry of Science, Technological Development and Innovation and UNICEF created a list of digital tools for students in need to use while participating in e-learning;[115]
- The Social Inclusion and Poverty Reduction Unit (SIPRU) translated guidelines issued by the Smart Learning Institute of Beijing Normal University on how to support students with disabilities who are navigating e-learning amid school shutdowns;[116]
- 2020 National Giving Day, organized under the theme of "Serbia Without Borders," was dedicated to persons with disabilities in their campaign to increase accessibility in society, emphasizing how these individuals have the right to participate in the information economy;[117]
- 2020 National Giving Day also saw SIPRU translate a video entitled, "Meet the Normals – Adventures of Universal Design," an animation highlighting the barriers to participation in society created by the Centre for Excellence in Universal Design of Ireland's National Disability Authority, in partnership with the Dublin Institute of Technology, the Maynooth National University of

[113] For more information on the decree, visit the following link: http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/uredba/2018/104/5/reg.
[114]For more information on this strategy, visit the following link: http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2020/44/1/reg.
[115]For more information on this toolkit, visit the following link: https://socijalnoukljucivanje.gov.rs/rs/lista-digitalnih-alata-za-rad-sa-decom-i-ucenicima-kojima-je-tokom-ucenja-na-daljinu-potrebna-dodatna-podrska/.
[116]For more information on these guidelines, visit the following link: https://socijalnoukljucivanje.gov.rs/wp-content/uploads/2020/12/Smernice_o_realizaciji_otvorenog_ucenja_i_ucenja_na_daljinu_za_ucenike_sa_smetnjama_u_razvoju_i_invaliditetom_COVID-19.pdf.
[117]For information on the 2020 event, visit the following link: https://ndd.srpskifilantropskiforum.org/cir.

Ireland, Dundalk IT, the National Learning Network, Cambridge University, the Cork Institute of Technology, and the Institute of Technology Blanchardstown, as part of the study "Integrating Universal Design Content in Third Level Curriculum."[118]

2.3. Building Block 3: Value Creation

One of the most important triggers of the digital transformation at the national level is the government's approach to ICT for governance, administration, and the delivery of public services through digital platforms.

This section will look at i) the approach to e-government in Serbia; ii) the administration of digital services; iii) the management of data; iv) policies designed to spur innovation and entrepreneurship; and v) efforts to create an environment that nurtures innovation across sectors.

2.3.1. Whole-of-Government

According to the European Commission Progress Report 2023, the e-government national portal is continuously upgraded with new services, serving as a one-stop shop for e-government services and as a central point of access for businesses and citizens. Serbia's communications infrastructure still requires systematic improvement of both regulation and investment. Broadband roll-out is too slow, preventing the uptake of eGovernment and business services, and slowing down the digital transformation of the economy. There was some progress with the connection of public institutions and 150 000 households to fast broadband and speeds of 100Mbps. Supported by the inflow of Russian citizens to Serbia, the robust growth of the information and communication sector continued, with exports of ICT services in 2022 valued at EUR 2.7 billion, an increase of 45% compared with 2021.[119]

E-government services have been prioritized by the Serbian government for many years. In 2017, the government took the step of establishing the Office for IT and eGovernment, empowering the institution to lead all policies related to e-services. A year later, in December 2018, the office created the National Open Data Portal.[120] This online resource act as a central clearing house for government data. It is also linked with the Open Data Portal created by the EU.[121] The project is being co-managed by the following

[118]For more information on the video, visit the following link: https://socijalnoukljucivanje.gov.rs/en/meet-the-normals/.
[119] European Commission Progress Report Serbia 2023 https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_695_Serbia.pdf
[120]For more information on this online resource, visit the following link: https://www.ite.gov.rs/tekst/en/30/open-data-portal.php.
[121] For more information on the resource, visit the following link: https://www.ite.gov.rs/tekst/en/30/open-data-portal.php.

actors: the UN Development Programme (UNDP) in Serbia, the World Bank, the UK Government's Good Governance Fund (GCF), and the Swedish International Development Cooperation Agency (SIDA).[122]

There are a variety of indices which are helpful when trying to understand the status of e-government in Serbia. In the 2022 edition of the E-Government Development Index (EGDI), it placed 40th out of 193 countries, grouping them in the category of states with a "Very High" EGDI. Serbia had a jump of 18 places from the last 2020 edition of the E-Government Development Index, where it was ranked at the 58th place among the "High" EGDI. This jump means that Serbia is among three countries with the highest jump in Europe and among the top 10 countries in the world with the highest jump in two years, since the previous edition of the EGDI. Mathematically, the EGDI is a weighted average of three normalized scores on three most important dimensions of e-government, namely:

1. scope and quality of online services (Online Service Index, OSI),
2. development status of telecommunication infrastructure (Telecommunication Infrastructure Index, TII), and
3. inherent human capital (Human Capital Index, HCI).

Each of these indices is a composite measure that can be extracted and analysed independently. On the Online Service Index (OSI), Serbia received a score of 0.8514; on the Telecommunication Infrastructure Index (TII), country scored 0.7865, and on the Human Capital Index (HCI), Serbia scored 0.8332. As seen in the chart below, significant progress has been made in all sub-indexes.[123]

Year	EGDI Group	EGDI 2022	EGDI 2022 Rank	OSI 2022	OSI 2022 Rank	TII 2022	TII 2022 Rank	HCI 2022	HCI 2022 Rank
2020	**High EGDI**	0.7474	**58**	0.7941	43	0.62	82	0.828	55
2022	**Very High EGDI**	**0.8237**	**40**	**0.8514**	**26**	**0.7865**	**55**	**0.8332**	**59**
		Change	**18**		17		27		-4

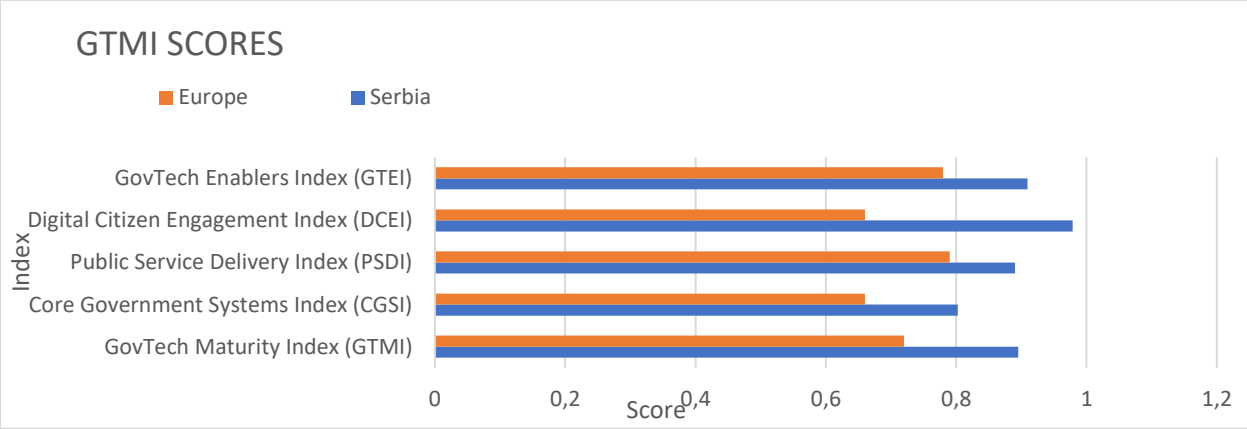
According to World Bank's GovTech Maturity Index published in 2022, Serbia's value is exceptionally high 0,895.[124] Only ten countries in the world have a higher GMTI: Republic of Korea, Brazil, Saudi Arabia, United Arab Emirates, Estonia, France, India, Lithuania, Mongolia, Russian Federation. Serbia ranks 11 out

[122] Serbia – Country Commercial Guide, International Trade Administration (2022), https://www.trade.gov/country-commercial-guides/serbia-information-and-communications-technology-market.
[123] UN E-Government Development Index (EGDI) https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/151-Serbia
[124] World Bank's GovTech Maturity Index https://www.worldbank.org/en/programs/govtech/gtmi

of 198 assessed economies. This means that in the span of two years, Serbia progressed 40 positions on the list. The GTMI is the simple average of the normalized scores of four components:

1. CGSI: The Core Government Systems Index (17 indicators) captures the key aspects of a whole-of-government approach, including government cloud, interoperability framework and other platforms.
2. PSDI: The Public Service Delivery Index (9 indicators) measures the maturity of online public service portals, with a focus on citizen centric design and universal accessibility.
3. DCEI: The Digital Citizen Engagement Index (6 indicators) measures aspects of public participation platforms, citizen feedback mechanisms, open data, and open government portals.
4. GTEI: The GovTech Enablers Index (16 indicators) captures strategy, institutions, laws, and regulations, as well as digital skills, and innovation policies and programs, to foster GovTech.

Serbia ranks the highest at the Digital Citizen Engagement Index - 0,9787, third highest among all assessed economies. GovTech enablers is also very high – 0,910. Core Government Systems Index with a value of 0.802 and the Public Service Delivery Index with a value of 0,890 are also both within the top 25% of world economies. Aside from being rated 11th in the world, as seen in the chart below, all components are assessed significantly above European average.



There is also an opportunity for Serbia to turn to the UN family as it pursues the digitalization of its services. One initiative, GovStack, may be an invaluable resource to policymakers passionate about this issue. The multi-stakeholder project aims to accelerate partner countries' adoption of e-government solutions as a means of improving service delivery.[125] It is led by a diversity of actors who are well-versed on this subject, like ITU, the Digital Impact Alliance (DIAL), the Ministry of Foreign Affairs of the Republic of Estonia (MFA Estonia), the Federal Ministry for Economic Cooperation and Development of the Federal Republic of Germany (BMZ), and Gesellschaftfür Internationale Zusammenarbeit (GIZ). For Serbia, leaders would have the chance to learn from the team at GovStack, discovering the practices which can be

[125]For more information about GovStack, visit the following link: https://www.govstack.global/.

implemented to unlock digital transformation.[126] Ultimately, it may have the effect of simplifying state-citizen interactions within the digital space.

2.3.2. Digital Services

Creating a more user-oriented administration remains a government priority. The Office for IT and eGovernment and the Prime Minister's Office, together with the recently established Ministry of Information and Telecommunications, continued to lead in this area. Progress in key enablers, such as the cloud-based e-signature and user-friendly payment services, contributed to further development of e-services. The number of databases connected to the Government Service Bus - an information system linking major databases - has increased. Digital signatures are being used but by a limited number of people.

Digital services are fundamental enablers of digital transformation. E-learning, for instance, can expand the horizons of students. Other areas, such as e-agriculture and e-health, can lead to improvements in many aspects of citizens' lives. Looking at the case of Serbia, officials are exploring how best to leverage digital technologies for service delivery. Implementing policy changes could expedite the process of digital transformation.

In 2017, the Government of Serbia created an E-Government Coordination Council consisting of stakeholders in both administration and government who explored how technology could improve the work of administration. In practice, the council facilitates public-private dialogues on how to operationalize e-governments, guiding discussions on a range of issues including electronic payments and information management.[127] The government also sought to introduce e-agriculture into the country, as well as integrate ICTs into public schools through the council.[128]The project is reflective of Belgrade's commitment to improve the wellbeing of citizens via digitalization.

A strategic vision for e-government development has taken shape in recent years as well. After a positive ex post analysis of E-Government Development Programme 2020-2022, the current E-Government Development Programme of the Republic of Serbia 2023-2025 was adopted, to provide insight into how policymakers view the utility of ICTs, as well as how they intend to revamp all levels of government in

[126] Scalable e-Government Solutions for Developing Countries via the GovStack initiative, GovStack (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Scalable%20e-government%20solutions%20for%20developing%20countries/GovStack_General%20Info_v20210705_ET4C.pdf.
[127]For more information, visit the following link: https://www.ekapija.com/en/news/1867917/coordination-council-for-e-government-soon.
[128]For more information, visit the following link: https://www.ekapija.com/en/news/1867917/coordination-council-for-e-government-soon.

preparation for digitalization.[129] The Strategy's main objective is stated as Development of efficient and user-friendly oriented government in digital environment. Other objectives include: Opening of data in public administration, Increasing the availability of e-government to citizens and the economy, through the improvement of customer services, Improvement of legal security in the use of e-government and Infrastructure development in e-government and securing interoperability.

ICTs in Education

As mentioned in previous sections, Serbian policymakers have looked for various ways to integrate information technologies into the classroom environment. The names of these documents, all of which are involved in the digitalization of schools in one form or fashion, are included in the list below:

- Strategy for Educational Development up to 2020[130]
- Strategy for Educational Development up to 2030[131]

The COVID pandemic also brought renewed attention to the role that information technologies play in the day-to-day experiences of Serbian students. Amid school shutdowns, the government launched online portals that would enable students to continue their educations in a virtual setting.[132] Collaborative partnerships were also forged with leaders in the private sector, such as Microsoft and Informatika's work in preparing general instructions on how local educators should navigate their Office 365 platform.[133] Thecrisis underscored both the advantages and drawbacks of e-learning, providing policymakers with the opportunity to reflect on their approach to digitalising education.

The pandemic also drew attention to the lack of resources available for e-learning. According to recent estimates, approximately 762, 860 households in the country do not have a personal computer (PC).[134] The same report also lists that 564,346 of these families do not have regular access to wireless services. As a result, greater attention has been paid to school connectivity, where available statistics show that the Serbian school system is behind OECD international averages. A graphic reflecting this "gap," as well as what this means for interventions in the future, can be seen below:

---

[129] E-Government Development Programme of the Republic of Serbia 2023-2025 (Serbian) https://mduls.gov.rs/wp-content/uploads/Program-razvoja-elektronske-uprave-za-period-od-2023.-do-2025.-godine-sa-Akcionim-planom.pdf

[130] Connectivity in education: Status and recent developments in nine non-European Union countries, ITU-UNICEF (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf.

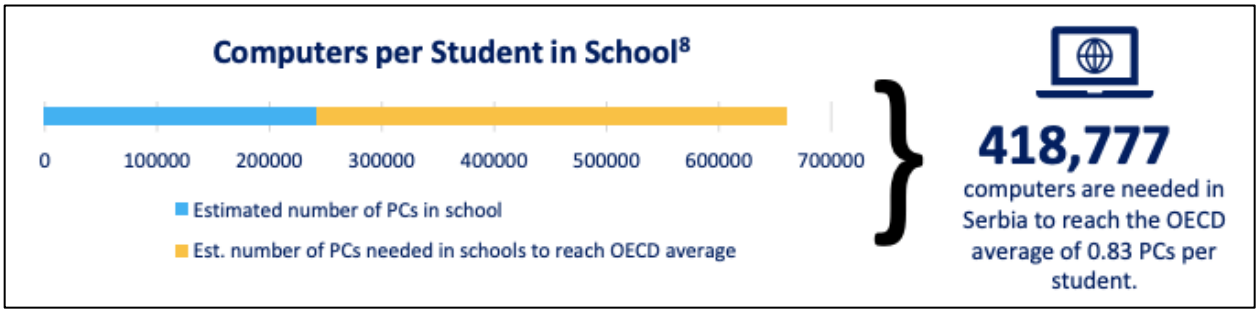
[131] Connectivity in education: Status and recent developments in nine non-European Union countries, ITU-UNICEF (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf.

[132] Connectivity in education: Status and recent developments in nine non-European Union countries, ITU-UNICEF (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf.

[133] For more information on this collaboration, visit the following link: https://rasporednastave.gov.rs/alati-uputstva.php.

[134] Serbia Country Brief – Connectivity in Education, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/ITU-UNICEF%20Connectivity%20in%20education/summary%20report%20per%20country/Serbia%202-Pager_final.pdf.

Figure 6. School Computer Estimates Compared to Recent OECD Averages[135]



Given the current situation, key policymakers have invested considerable resources is broadband expansion. In 2021, they partnered with the European Bank for Reconstruction and Development (EBRD) on a project entitled "Next Generation Broadband Connectivity for Rural Schools in White Zones," a venture that was made possible through funds provided by the Western Balkans Investment Framework (WBIF).[136] In essence, the goal of these efforts was to improve the resilience of networks in rural ("white") zones, ensuring that students from these areas were able to stay connected. Other objectives are included in the following list:[137]

- Completion of detailed fixed-broadband availability mapping in intervention areas (already conducted);
- Connection of rural/white zone schools to broadband with appropriate speed (600 schools in the second phase and 900 in the third phase);
- Provision of next-generation (above 30 Mbit/s) connectivity to households in rural/white zones (90,000 households in the second phase and 135,000 households in the third phase);
- Improvement of education quality in schools, employment of IT teachers, and integration of Internet usage training into everyday schoolwork for students in rural/white zones;
  Improvement of the quality of life in rural areas through better access to services and information, with broadband connection enabled at an appropriate speed.

Digital Agriculture

[135] Serbia Country Brief – Connectivity in Education, ITU (2021), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/ITU-UNICEF%20Connectivity%20in%20education/summary%20report%20per%20country/Serbia%202-Pager_final.pdf.
[136] For a press release on this multi-stage project, visit the following link: https://www.ebrd.com/news/2021/ebrd-and-wbif-support-serbia-to-expand-broadband-to-rural-areas-.html.
[137] Connectivity in education: Status and recent developments in nine non-European Union countries, ITU-UNICEF (2021), https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf.

The National Programme for Rural Development (2018-2020), based in large part off standards set by the EU, included a timetable for the establishment of an Integrated Administrative and Control System.[138] It also called for piloting a Land Parcel Identification System (LPIS) for the purpose of increasing sectoral efficiency. Finally, this strategy paved the way for legislation related to e-agriculture. The passage of the Law on the National Spatial Data Infrastructure in 2018 has made a difference in changing how tracts of lands are managed and allocated. These changes may lead to improve Serbia's prospects of EU accession.

Additionally, policymakers explored the ways technology can improve the production of food. The country's Smart Specialization Strategy (2020-2027), for instance, investigates how ICTs can unlock the future of food.[139] These efforts are being supported by the BioSense Institute, a group that studies topics ranging from nanoelectronics to robotics.[140] Their mission is to conduct research into technologies as a way of making agriculture more efficient and sustainable. Critically, they also believe that e-solutions can provide information about the sector to officials, allowing them to make more informed decisions. In 2023, BioSense capacities have been expanded with almost 7 000 square metres of state-of-the-art facilities. As part of the University of Novi Sad, the new building will welcome some 250 scientists and start-ups to develop innovative solutions in agriculture and biotech. BioSense provides competitive services and introduces digital innovations, while connecting research, entrepreneurship, science and market-ready solutions. Funds for the construction of the building came from €14 million of EU grants to the Institute's ANTARES project, which aims to make BioSense a "European Centre of Excellence." That is complemented by €20 million financing from the European Investment Bank, as part of a loan signed in 2010 for research development in Serbia, and the Serbian government. In the Western Balkans, the European Investment Bank has provided €415 million in financing for this sector since 2005, helping to build, renovate and digitalise facilities for education and science.

With a budget of almost €30 million, ANTARES is the largest research project ever funded by the European Union in Serbia. It has enabled the BioSense Institute to grow from only 50 employees at the beginning in 2017 to over 140 employees, with over 50 holding a doctorate. [141]

While these policies have been in place for some time, they did not have a great impact inchanging the attitudes of farmers. A recent survey showed that only 14 per cent of Serbian farmers had adopted smart technologies into their day-to-day practices.[142] Notably, 81 percent of all respondents cited that the cost

[138] Status of Digital Agriculture in 18 countries of Europe and Central Asia, ITU and FAO (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%20%287%29.pdf.

[139] For more information about this strategy, visit the following link: https://pametnaspecijalizacija.mpn.gov.rs/wp-content/uploads/2021/06/Strategija-pametne-specijalizacije_EN_WEB.pdf.

[140] For more information about the organisation, visit the following link: https://biosens.rs/.

[141] For more information, visit the following link: https://www.eib.org/en/stories/biosense-novi-sad-innovation-agriculture-food-security

[142] Status of Digital Agriculture in 18 countries of Europe and Central Asia, ITU and FAO (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%20%287%29.pdf.

of equipment dissuaded them from making the investment.[143] However, the study also revealed that there are areas for improvement. Specifically, 94 per cent of interviewees indicated that they would adopt technologies if they received subsidies from the government.[144]

Several projects have been launched that strive to address this "affordability question." A prime example of this is BioSense's "AgroSense," a digital platform launched in 2017 that helps over 20,000 local farmers monitor crop status.[145] This service was designed to meet the needs of large-, medium-, and small-scale farmers. AgroSense also provides a space for farmers of all types to plan agricultural activities. The digital tools offered through this novel solution have been roundly praised by local farmers for providing them with useful information at no cost.

The BioSense institute has also developed a method for the early prediction of wheat yields, based on artificial intelligence algorithms. The device, Plant-O-Meter, emits light from selected parts of the spectrum that is reflected by the plant and provides a precise assessment of its condition in just a few seconds. The data is sent via a Bluetooth connection to the farmer's smartphone, together with the GPS location of the sample. In addition, perhaps the most well-known of BioSense's inventions is a robot called Lala that moves along a predefined path within a plot of land, samples the soil and immediately analyses it. This helps farmers make decisions regarding sowing, watering, and the application of fertilisers, pesticides, and herbicides. Lala received funding from the European Union's Horizon 2020 research and innovation programme.

Krivaja DOO is another innovative solution the overall adoption of smart technologies in the agricultural field. The digital demonstration farm highlights how tech-enabled solutions can be used for precision agriculture management. Field events, as well as public presentations, have attracted the interest of many in the farming sector. Similar products, such as "agroNET," also make use of cutting-edge tools to improve production output.[146] While scalability remain a concern, these ventures have demonstrated that e-solutions are within reach for many farmers in Serbia.

The new eAgrar information system, launched in 2023, has been introduced with the aim of modernizing and speeding up the data entry process, changing data in the Register of Agricultural Holdings (RPG), as well as approving and paying incentives in agriculture.

---

[143] Status of Digital Agriculture in 18 countries of Europe and Central Asia, ITU and FAO (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%20%287%29.pdf.

[144] Status of Digital Agriculture in 18 countries of Europe and Central Asia, ITU and FAO (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%20%287%29.pdf.

[145] Status of Digital Agriculture in 18 countries of Europe and Central Asia, ITU and FAO (2020), https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Status%20of%20Agriculture%20in%20Europe%20and%20Central%20Asia%20%287%29.pdf.

[146] For more information on agroNET, visit the following link: https://digitalfarming.eu/.

eAgrar allows online registration of agricultural holdings, access and management of data through the portal on a daily basis by farmers, online submission of requests for incentives in agriculture; saving time in the processing of requests due to the introduction of automatic verification of the formal conditions of requests, as well as electronic processing of requests; faster approval of incentives, faster payment; reducing the possibility of errors when submitting and processing requests, as well as speeding up the processing of requests due to the binding of relevant registers; abolition of the need for printing and archiving paper documentation; enabling more efficient reporting, monitoring of incentive statistics and a greater degree of control.

The legislative framework for the Introduction of eAgrar was created by amendments to the Law on Agriculture and Rural Development at the end of 2021. Previously, the register and procedures related to Register of Agricultural Holdings and the approval of incentives were formulated in 2004, so many technological, software, and procedural solutions are outdated. The procedure was complicated, which delayed the approval and payment of incentives. So, for example, to enrol in the Register, it was necessary to go to a minimum of 4 institutions and fill in 89 data on 8 different forms/attachments, many of which were entered multiple times. It was estimated that it was necessary to set aside 4.5 hours for the preparation and submission of the request and 1320 RSD (over 11 EUR) for fees, commissions and for printing the documentation. Individual data was manually checked for each request by comparing the data from the request and the supporting documentation, using 3 different applications. All documentation had to be printed and archived, while a lot of time was wasted in the delivery of paper requests and solutions.

Digital Health

Serbia has made great progress over the last year towards digitalising the provision of healthcare. Government institutions, such as the Medicines and Medical Devices Agency, have updated their practices to integrate e-service solutions.[147] Patients can submit requests, upload documents, and schedule appointments with the organisation via their web portal. Laws, namely the Health Documentation and Records in the Area of Health Act, regulate records stored online, allowing medical professionals to access patient information with relative ease.[148]The Act catalogues information from health institutions, private practices, and insurance companies. Though only one Act has been put in place, it is indicative of the larger changes occurring within Serbia's medical field.

Many medical institutions have fully engaged with the digitalisation process. Even so, challenges remain. In September 2017, an individual filed charges against a centre that stored hard copies of their information and failed to implement any safeguards.[149] The data was shared online, resulting in a breach of privacy

[147] In brief: digital healthcare in Serbia, BiseraAndrijašević and Bogdan Ivanišević (2022), https://www.lexology.com/library/detail.aspx?g=408741a4-8578-4cc3-8846-39e53f698545.
[148] In brief: digital healthcare in Serbia, BiseraAndrijašević and Bogdan Ivanišević (2022), https://www.lexology.com/library/detail.aspx?g=408741a4-8578-4cc3-8846-39e53f698545.
[149] In brief: digital healthcare in Serbia, BiseraAndrijašević and Bogdan Ivanišević (2022), https://www.lexology.com/library/detail.aspx?g=408741a4-8578-4cc3-8846-39e53f698545.

that placed the institution under scrutiny. This underscored how healthcare providers often lack the proper tools to guarantee data security. Policymakers must be mindful of these issues as they pursue efforts to provide digital health services.

eHealth portal and app enables citizens to view their health data, i.e. electronic health record with data entered based on examinations in the state institutions they visited; view all types of reports - specialist reports, radiological, laboratory and other reports from state health institutions; book appointments of an examination with their selected general practitioner; view the list of prescribed prescriptions.

eGovernment portal also enables services such as to apply for the health insurance card to be delivered to your address. A special demographic measure was digitalized as well, IVF with donated material.

Linking the archives of all health institutions into a single data system, the establishment of ePatient Card and the Register of genetic and biomedical data are the key innovations brought about by the new Law on Health Documentation and Records adopted in 2023.[150] With the introduction of the ePatient Card, for the first time, the history of diseases and treatment of citizens from health centers, hospitals, state and private practices will be unified in one place, and access to the ePatient Card will be available to the selected doctor, authorized specialist, emergency medical service, medical commission, or any doctor to whom the patient gives access. This will speed up the journey through the health system, prevent repeated analyses and returning to the general practitioner for new instructions, which will overall contribute to more effective treatment results. In addition, another very important innovation is the establishment of the Register of Genetic and Biomedical Data, which opens the door to the development of modern diagnostics, early detection of genetically determined diseases and the development of personalized medicine.

In Serbia, genetic analyses are already carried out at 11 institutes. By establishing the Registry, safe storage of this sensitive information in the State Data Center is enabled. When combined with health data, it is expected to have a much greater potential for improving diagnostics, prevention and treatment of patients suffering from many hereditary and rare diseases, development of personalized therapies and improvement of public health in general. Through this system, it will be possible to connect scientific-research institutes dealing with genetic analyzes and the health system, secure exchange of biomedical data, necessary for the interpretation of genetic analyses, and deliver the results of those tests to the ePatient Card with the necessary data protection or encryption.

The establishment of the Registry will guarantee the highest level of security and data protection, and the new Law will regulate the issue of access and use for scientific and research purposes, with the aim of preventing unscrupulous, unethical access to information, and ensure the use of anonymized, aggregated and statistical data, which enable development of biomedical science and software that provide faster

[150] Law on Health Documentation and Records (Serbian) https://www.paragraf.rs/propisi/zakon-o-zdravstvenoj-dokumentaciji-i-evidencijama-u-oblasti-zdravstva.html

diagnostics, easier identification of rare diseases and conditions, contraindications or potential side effects. [151]

Disruptive technologies are also being piloted in the public sector. Public healthcare in Serbia is being transformed through the innovative use of mixed reality technology powered by AI, increasing efficiency and quality of healthcare, minimising risks and efforts, and optimising procedures. This innovation was launched during the COVID-19 pandemic to reduce the exposure of staff in the red zone, and to minimise their levels of stress and exhaustion, which were manifested in the rising incidence of burnout.

With the support of the Office of the Prime Minister and through partnership with Microsoft, the University Hospital Centre piloted Hololens2, a mixed-reality device that revolutionised healthcare collaboration and improved the efficiency and quality of healthcare, as well as working conditions for doctors. Rather than the entire medical team, only one doctor enters the red zone with the mixed-reality headset and views all relevant medical documentation and images as 3D holograms, while other doctors monitor from outside providing input and advice.

Beyond the excellent results during the pandemic in terms of medical service delivery and education, mixed reality can play a key role in providing the highest level of healthcare even in the most remote areas, saving time and money, and raising the quality of the service, as top medical teams can remotely treat patients whenever they are located. Indeed, the Serbian Government has recognised this initiative as a promising innovation and has decided to equip all medical centres with mixed-reality technology as part of long-term plans.

This innovation has been featured in the OECD Observatory of Public Sector Innovation Case Study Library[152] as well as Global Trends in Government Innovation 2023.[153]

Circularity of electronics

In the past two decades, Serbia has implemented numerous measures designed to mitigate the many problems caused by rampant e-waste. The country ratified the Basel Convention in April 2000.[154] It also joined the Stockholm Convention in May 2002, with the statute entering into force in October 2009.[155] Finally, it became a signatory to the Rotterdam Convention in July 2009, coming into law in October

[151] For more information, please visit the following link: https://naled.rs/vest-stize-ekarton-usvojen-zakon-o-zdravstvenoj-dokumentaciji-8433
[152] OECD Observatory of Public Sector Innovation Case Study Library https://oecd-opsi.org/innovations/mixed-reality-healthcare/
[153] Global Trends in Government Innovation 2023 https://oecd-opsi.org/publications/trends-2023/
[154] For a list of countries party to the Basel Convention, visit the following link: http://www.basel.int/?tabid=4499.
[155] For a list of countries party to the Stockholm Convention, visit the following link: http://www.pops.int/Countries/StatusofRatifications/PartiesandSignatoires/tabid/4500/Default.aspx.

2009.[156] Joining these international agreements shaped the legal framework for dealing with electronic waste.

The countries' policy on e-waste has been shaped by statutes found in the EU. Specifically, there are a pair of policies that policymakers in Serbia have used as a reference for their solutions. Directive 2012/19/EU ("On Waste Electrical and Electronic Equipment") outlines how countries should deal with waste electrical and electronic equipment (WEEE).[157] The second, Directive 2011/65/EU ("On the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment"), revolves around dealing with waste that may be damaging to the health and wellbeing of citizens.[158]

ITU, UNEP, and UNITAR are assisting the country in tackling this challenge with the "E-Waste Monitor for the Western Balkans" project. The initiative aims to train officials on how to make and collect e-waste statistics, as well as assess the state of e-waste statistics, e-waste management practices, and the e-waste legislative landscape throughout the 5 Western Balkans countries. The project will conclude in June 2023 with an E-Waste Monitor Report.[159]

2.3.3. Digital Content and Data

The Law on Protection of Personal Data (Official Gazette of the Republic of Serbia, No. 87/2018) is the main regulation which defines the handling of personal data in the country.[160] It is upheld by the Commissioner for Information of Public Importance and Protection of Personal Data (*Poverenik*), which is responsible for facilitating the implementation of the law. Many of its tenets align with the principles laid out in the EU's General Data Protection Regulation (GDPR). This change was seen as a way of bolstering the country's case for admission into the EU. While it was enacted in November 2018, its effective date was pushed until August 2019.

While the 2018 law is the primary example of data privacy legislation, there are a variety of relevant by-laws that shape enforcement practices:[161]

[156]For a list of countries party to the Rotterdam Convention, visit the following link: http://www.pic.int/Countries/Statusofratification/PartiesandSignatories/tabid/1072/language/en-US/Default.aspx.

[157] For more information on this statute, visit the following link: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0019.

[158] For more information on this statute, visit the following link: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32011L0065.

[159]For more information on the 'ITU-UNEP-UNITAR E-Waste Monitor for the Western Balkans', visit the following link: https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Regional%20Initiatives/2022/ITU-UNEP-UNITAR-E-Waste-Monitor-for-the-Western-Balkans.aspx

[160]Data Protection Laws of the World: Serbia, DLA Piper (2022), https://www.dlapiperdataprotection.com/index.html?t=law&c=RS.

[161]For more information on these laws, visit the following link: https://www.dataguidance.com/notes/serbia-data-protection-overview.

- Rulebook on the Manner of Prior Review of the Personal Data Processing (Official Gazette of the Republic of Serbia, No. 35/2009): Regulates the process for notifying and approval by authorities responsible for personal data processing;
- Decree on the Form for and Manner of Keeping Records of Personal Data Processing (Official Gazette of the Republic of Serbia, No. 50/2009):Regulates how to keep records on data, personal data processing, and the procedures institutions should follow when keeping records of personal data processing;
- Rulebook on the Form and Manner of Keeping Record of the Data Protection Officer (Official Gazette of the Republic of Serbia, No. 40/2019): Regulates how to keep records on the activities of data protection officers;
- Rulebook on the Form and Manner of Keeping Internal Record of Violations of the Law on Personal Data Protection and Measures Undertaken in the Couse of Inspection Supervision (Official Gazette of the Republic of Serbia, No. 40/2019): Regulates how to keep records on violations of the law as well as any ensuing investigations;
- Rulebook on the Form of Notification on Personal Data Breach and Manner of Notifying the Commissioner for Information of Public Importance and Protection of Personal Data on Personal Data Breach (Official Gazette of the Republic of Serbia, No. 40/2019): Regulates how to use the notification form for personal data breaches as well as how to inform to Poverenik about incidents;
- Rulebook on the Complaint Form (Official Gazette of the Republic of Serbia, No. 40/2019): Regulates how an individual can use a complaint form if they believe the Poverenik has handled their data in a manner that violates the law;
- Decision on the List of Types of Personal Data Processing Operations for Which an Assessment of the Impact on the Personal Data Protection Must be Performed and the Opinion of the Commissioner for Information of Public Importance and Personal Data Protection Must be Sought (Official Gazette of the Republic of Serbia, No. 45/2019, 112/2020): Regulates how the data controller should perform an impact assessment prior to conducting personal data assessments;
- Decision on the List of Countries, Parts of Their Territories or One or More Sectors of Certain Activities in Those Countries and International Organisations where it is Considered That an Adequate Level of Protection of Personal Data is Ensured (Official Gazette of the Republic of Serbia, No. 55/2019): Regulates what countries are considered to be in compliance with the law on the protection of data;
- Decision on Determining Standard Contractual Clauses (Official Gazette of the Republic of Serbia, No. 5/2020): Regulates the contractual relations between a controller and a processor;
- Rulebook on the Form of Identification Card of the Authorised Person for Performing Inspection Supervision in accordance with the Law on Protection of Personal Data (Official Gazette of the Republic of Serbia, No. 61/2019): Regulates the forms of identification which can be used by persons authorised to conduct inspections.

2.3.4. Innovation and Entrepreneurship

Serbia has endeavoured to position itself as a destination for foreign investors looking to expand into untapped markets. Through a combination of tax incentives and favourable regulations, the government aimed to reduce the barriers to entry into the ICT sector. In fact, it is estimated that an investor from abroad may achieve up to 30% higher net profit than if the same project was conducted in their country of origin.[162]In spite of these gains, problems like the lack of clear mechanism for adjudicating disputes over intellectual property (IP) undercut the appeal of the Serbian market.[163] These "cons" are weighed against to "pros" of doing business in the country, such as the country's liberalised registration process. ITU has noted that expatriates are able to normalise their status, and start doing business, in less than 1.5 months.[164]

As for national entrepreneurs, there are a number of companies which have found success in the region and throughout Europe:

1. ComTrade Group: Software and IT solutions firm specialising in large-scale storage systems;[165]
2. Nordeus: Gaming firm specialising in mobile applications;[166]
3. Roaming Networks: Logistics firm specialising in systems integration;[167]
4. HTEC, global end-to-end engineering and digital product development company[168]
5. 3lateral Studio, developing innovative technologies that enable digitization of human appearance and motion at an unprecedented level of realism[169]
6. SevenBridges, biomedical data company, specializing in software and data analytics to drive public and private healthcare research.170

Interest in entrepreneurship has increased significantly in Serbia, particularly among millennials who are more comfortable with risk-taking. However, a large percentage of society still prefers a stable job rather than starting their own venture. The stigma of failure remains one of the biggest obstacles. This is changing slowly as more success stories are being shared in the ecosystem. For example, the highprofile $378M exit of Serbian mobile games company Nordeus is inspiring other entrepreneurs. At the pre-idea stage, entrepreneurs start to explore innovation while support institutions such as the Innovation Fund help cultivate their interest by fostering an entrepreneurial culture. Some start-ups are beginning to engage with local problems and develop solutions they can commercialise. However, academia does not produce

[162]Digital Innovation Profile: Serbia, ITU (2018), https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/eBAT_Brochure%E2%80%93DIP%20Serbia_432746_.pdf.
[163]Digital Innovation Profile: Serbia, ITU (2018), https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/eBAT_Brochure%E2%80%93DIP%20Serbia_432746_.pdf.
[164]Digital Innovation Profile: Serbia, ITU (2018), https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/eBAT_Brochure%E2%80%93DIP%20Serbia_432746_.pdf.
[165] For more information about the company, visit the following link: https://www.comtrade.com/.
[166] For more information about the company, visit the following link: https://nordeus.com/.
[167] For more information about the company, visit the following link: https://www.roamingnetworks.com/?lang=en.
[168]For more information about the company, visit the following link: https://htecgroup.com/about-us/
[169]For more information about the company, visit the following link: https://www.3lateral.com/about-us.html
[170]For more information about the company, visit the following link: https://www.sevenbridges.com/

enough research that identifies these needs and is doing little to encourage researchers to create start-ups. Although Serbia has technical talent on par with the best markets in the world, soft skills, mainly international marketing, sales, and communication, are lacking in the ecosystem. Therefore, entrepreneurs do not always have the skills they need to develop strong business models. The main challenge on the ground is access to venture finance. Therefore very few start-ups survive the valley of death to gain the status of high-growth SMEs or successfully exit. The public sector is trying to address this and has created a state VC fund Telecom Serbia (25M euro). However, venture capital-backed exits are not very common, and Serbia is still trying to cultivate its first unicorn. Entrepreneurs must collaborate with academia to accelerate their digital transformation, learn essential business skills, and focus on relevant ecosystem problems.

Events organised by both the public and private sectors connect and inspire innovators at the pre-idea stage. Several international conferences, including the Western Balkans Digital Summit, Data Science Conference and AI Wonderland Summit, bring entrepreneurs together to share experiences and collaborate. Hackathons and competitions are being organised by corporates and universities to stimulate ideation. There has been significant investment in hard infrastructure in Serbia, but more funding is needed in soft infrastructure. Science Technology Parks, start-up centres, and co-working spaces provide access to soft infrastructure, allowing innovators to access resources and knowledge. However, incubators are mainly independent and not well connected to the whole ecosystem. Support is focused on people already in the ecosystem and appears to be lacking for those outside. Established SMEs are supported by the Chamber of Commerce, the largest business network that advocates on their behalf. Accelerators are beginning to emerge, but the entrepreneurial support sector needs more funding to guide entrepreneurs through the valley of death.

One of the enablers of Serbia's digital innovation ecosystem and attractive business environment is the new Law on Digital Assets. This law recognizes virtual currency and digital tokens as legal digital assets, making Serbia one of only a few countries in the world to legalise them.[171]

2.3.5. Ecosystem Building

Serbian has a vibrant IT ecosystem with 8 universities, 4 Science Technology Parks, 15 startup centers, 20+ co-working hubs, 5 IT clusters and lots of industry events. Digital Serbia Initiative has been instrumental in bringing the ecosystem together, as a non-profit, non-governmental organization with the strategic goal of developing a strong, globally competitive digital economy in Serbia. Founded by leading digital players, it gathers more than 30 member-organizations from all sectors relevant for the growth of a digital

[171] Digital Innovation Profile (2022) https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/2022/Digital%20Innovation%20Profile%20Republic%20of%20Serbia.pdf

ecosystem – including tech, banking and finance, telco, consulting, legal, education and research, media, pharmaceutical, and startup support organizations.[172]

Stakeholders recognise a clear government vision and strategy for digitalization, which has been a key priority and has been promoted by the Prime Minister, Office for IT & eGovernment and IT sector. The newly formed Council for Development of Digital Economy is focused on the digitalization of the entire economy. It aims to increase financing for innovative companies, develop digital infrastructure and invest in research and development. Several strategies support this aim, including the Information Society and Information Security Development Strategy and Smart Specialization Strategy. Most recently, stakeholders have collaborated to develop the Strategy on the Development of the Start-up Ecosystem 2021-2025, the first strategy created by the ecosystem itself, with the government playing a supporting role.[173] Many initiatives delivered with the Serbian government support started within the private sector. Various actors are actively involved in the preparation of strategic documents, and propose amendments to the regulatory framework. As the ecosystem evolves, the private sector should continue to take the lead. This would increase resources within the ecosystem and enable capacity building. The Prime Minister's Office is well connected to all ecosystem players and there is support for a shared vision. At the national level the Office for IT develops infrastructure and eGovernment, the Innovation Fund supports start-ups, and the Science fund develops science and technology. Stakeholders view the Prime Minister's Office as the glue that holds the ecosystem together. Despite this, some actors feel that other parts of government have limited capacity and resources needed to push digital reform. Most stakeholders recognize existing issues, including the need for entrepreneurial skills development, talent retention and access to finance. However, this does not always translate into cross-collaboration. For example, there are few partnerships between the private sector and academia limiting applied research and technology transfer. Although strategies have been put in place to alleviate ecosystem issues, some actors feel that implementation has been slow. Not all ecosystem players fully recognize the benefits of incentives, so follow-up government campaigns would help drive awareness and engagement.

The creation of an atmosphere favourable to innovation in Serbia has been successful, yet challenges remain. According to the 2023 edition of the World Intellectual Property Organization's (WIPO) *Global Innovation Index*, the country is ranked 53rd out of 132 nations. The highest score was 35th place in Infrastructure and 41st place in the categories Market sophistication and Knowledge and technology outputs. The country saw its lowest score, 92nd ranked, in Creative outputs, which considers elements like global brand value and generic top-level domains.[174]Therefore, it is important to pay particular attention to fields focused on content creation in order to foster country's competitiveness in all areas of the digital economy.

Other indices are useful resources for understanding how Serbia seeks to become more competitive in the global marketplace. In the 2023 European Innovation Scoreboard, Serbia was classified as an

[172]For more information about the DSI, visit the following link: https://www.dsi.rs/en/
[173]Strategy on the Development of the Start-up Ecosystem 2021-2025 https://prosveta.gov.rs/wp-content/uploads/2021/12/Strategija-razvoja-stertup-ekosistema-RS-od-2021-do-2025.pdf
[174]Global Innovation Index 2023, WIPO (2023), https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023/rs.pdf

"Emerging Innovator," with its innovation performance evaluated at 61.8% of the EU average. This performance placed Serbia above the average of the Emerging Innovators category, which stood at 50.0%. Notably, Serbia's innovation performance showed a significant increase, rising by 15.6 percentage points, a rate higher than the EU's increase of 9.9 percentage points. This upward trend indicates that Serbia is narrowing its performance gap compared to the EU, reflecting advancements in its national innovation system.[175]

Events organised by both the public and private sectors connect and inspire innovators at the pre-idea stage. Several international conferences, including the Western Balkans Digital Summit, Data Science Conference and AI Wonderland Summit, bring entrepreneurs together to share experiences and collaborate. Hackathons and competitions are being organised by corporates and universities to stimulate ideation. There has been significant investment in hard infrastructure in Serbia, but more funding is needed in soft infrastructure. Science Technology Parks, start-up centres, and co-working spaces provide access to soft infrastructure, allowing innovators to access resources and knowledge. However, incubators are mainly independent and not well connected to the whole ecosystem. Support is focused on people already in the ecosystem and appears to be lacking for those outside. Established SMEs are supported by the Chamber of Commerce, the largest business network that advocates on their behalf. Accelerators are beginning to emerge, but the entrepreneurial support sector needs more funding to guide entrepreneurs through the valley of death.

To support the economy, the government is investing in R&D, start-ups, and innovative firms. The Innovation Fund plays an invaluable role in the national innovation journey, particularly in kick-starting innovation. National funding for research has increased through the newly established Science Fund but remains low as a percentage of GDP. However, universities are still struggling to fulfil their role and foster innovation. When it comes to research institutions, one challenge is that they define their own rules on IP ownership. The University of Belgrade has regulations in place so that the institution owns all IP created by university staff. This impacts collaboration between academia and industry, reducing the commercialization of applied research. Sharing IP ownership is essential to enable ecosystem evolution.

Serbia is also investing in enabling a thriving Artificial Intelligence Ecosystem as well. In 2019, the Serbian government adopted a Strategy for the Development of Artificial Intelligence (AI) for the period 2020-2025. The strategy aims to provide a comprehensive framework for the development and regulation of AI in Serbia, taking into account ethical, legal, and social implications. The strategy also seeks to foster innovation and promote the use of AI in various sectors of the economy.

In addition to the national strategy, the Serbian government has also established a regulatory sandbox for AI. The sandbox is designed to provide a controlled environment for testing new AI products and services, allowing businesses to experiment with AI technologies without being subject to full regulatory compliance. The sandbox is intended to encourage innovation and help businesses comply with future

[175] European Innovation Scoreboard 2023 https://ec.europa.eu/assets/rtd/eis/2023/ec_rtd_eis-country-profile-rs.pdf

regulations.[176] Furthermore, through a dedicated project, UNDP has been actively supporting the government's ambitious AI agenda, which has included things like establishing the Artificial Intelligence Institute and adopting an Ethical framework for Responsible AI Development.[177]

National Platform for Artificial Intelligence set up in the Government Data Center ensures that academia, scientists and researchers, as well as small industry actors such as start-ups, have access to supercomputing infrastructure necessary for the development and application of artificial intelligence. The National Platform for Artificial Intelligence provides users with an easier and faster way to solve AI tasks, the ability to solve large and complex problems, create better and more complex models with incomparable performance that allow more iterations and thus represents a serious resource to help strengthen the entire AI community and expand AI expertise in Serbia. Thanks to the national AI platform, currently over 200 experts are using the established supercomputing infrastructure for modelling and developing their AI-driven solutions. They are creating new products and services, experimenting, expanding their expertise, collaborating, sharing knowledge, and contributing to the development of AI ecosystem of excellence in Serbia. The AI Institute and 4 science and technology parks operating in the cities of Belgrade, Novi Sad, Niš and Čačak rely on this platform, as well as newly introduced public administration services and smart solutions allowing the government to innovate, make informed decisions and provide better services. AI Platform was presented at the Edge of Government exhibition at the World Government Summit, as well as featured at the OECD Observatory of Public Sector Innovation Case Study Library[178] and the Global Trends in Government Innovation 2023.[179]

In April 2023, Serbia adopted the Ethics Guidelines for the Development, Implementation and Use of Reliable and Responsible AI, based on UNESCO's recommendation on the ethics of artificial intelligence, which aim to align with EU guidelines on the ethical use of artificial intelligence.

GovTech is also an ecosystem that Serbia is working on strengthening. The goal is to accelerate digital transformation and the application of disruptive technologies in the public sector through better cooperation with innovative companies and start ups, and the public sector. Innovation Fund launched a call in 2023 for the first GovTech program.[180] The GovTech program aims to encourage the public sector to use innovative technological solutions in the provision of services and in its operations, thus accelerating the digital transformation of the public sector and "opening the door" to disruptive technologies. This approach to the modernization of the public sector promotes a simple, efficient and transparent state administration with a focus on citizens. One of the ways in this approach is the cooperation of the public sector with innovative companies, which, using data, disruptive technologies and innovative methodologies, create products and services that solve challenges in the public sector. In the first phase, public sector entities submit applications in which they describe challenges they face, for

[176] Strategy for the Development of Artificial Intelligence (AI) for the period 2020-2025 (Serbian) https://www.srbija.gov.rs/tekst/en/149169/strategy-for-the-development-of-artificial-intelligence-in-the-republic-of-serbia-for-the-period-2020-2025.php
[177] Fore more information, please visit the following link: https://www.undp.org/serbia/blog/serbia-prepares-ai-revolution
[178]OECD Observatory of Public Sector Innovation Case Study Library https://oecd-opsi.org/case_type/opsi/
[179] Global Trends in Government Innovation 2023, https://oecd-opsi.org/publications/trends-2023/
[180] For more information, please visit the following link: https://www.inovacionifond.rs/cir/program/govtech-program

which no adequate solution is available on the market. The result of the first phase is a list of approved public sector challenges for which an innovative solution will be sought in the second phase. Then, in the second phase, innovative entities and scientific research organizations submit applications with innovative solutions to public sector challenges, selected in the first phase of the program.

Serbia is also making substantial investments in the development of its biotech ecosystem, with the BIO4 Campus poised to become a prominent global hub for biotech advancement. Designed as a focal point for the convergence of individuals, knowledge, and infrastructure, this unique 20-hectare complex is dedicated to establishing Serbia as a new European center for biomedicine, bioinformatics, biotechnology, and biodiversity. The Campus will host a diverse array of tenants, including over 1,000 Ph.D. holders and more than 300 labs, comprising 9 scientific institutes, 7 faculties from the University of Belgrade, 7 core facilities, a convention and multimedia exhibition center, and R&D centers for pharmaceutical, biotech, and life science companies. Additionally, an extension of the Science-Technology Park Belgrade will provide comprehensive support for BIO4 startups. The Campus is on track to open its doors by the end of 2025.[181]

3. Conclusions

This document provides a framework to unravel digital development that includes the three building blocks of digital transformation. It provides information about Serbia for each domain, based on the experiences and activities of the ITU and other stakeholders operating in the country and wider region. This report will serve as a reference for discussions on digital development at the country level as well as stocktaking of relevant activities, initiatives and projects and experiences developed by UN agencies involved in digital transformation work in Serbia. It aims to provide the baseline study for strategic decisions on initiatives to be undertaken within the UN Sustainable Development Cooperation Framework (UNSDCF), on digital and ICT development matters, to support digital for development. It will serve as a guide for future dialogue with country stakeholders and pave the way for increasingly fit-for-purpose engagements of the UN system in the country.

[181] For more information, please visit the following link: https://bio4.rs/