Digital Innovation Profile
Republic of Serbia

Strategies and Recommendations for Accelerating Digital Transformation

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In collaboration with

Office of the Prime Minister

Republic of Serbia

Contents

Note

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Information in this profile that expresses opinions or claims has been informed by national stakeholder consultations and qualified through surveys, interviews, and workshops, which were further validated in the process of developing this profile.

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Process Summary

Digital Innovation Capacity

15+ development and tech indicators reviewed

Desktop Research

250+ country-specific documents reviewed

Stakeholder Identification

30 stakeholders directly engaged in activities

Co-Creation Workshops

2,500+ ideas captured through 3 workshops

National Stakeholders' Event

31 recommendations presented

Execution of Recommendations

$63.07 billion present-day GDP boosted

1. Introduction

Digital Innovation Profiles are an important element in the ITU series of snapshots of information and communication technology (ICT)-centric innovation ecosystems. Each profile assesses and summarises the opportunities and challenges in a country's ICT ecosystem. The at-a-glance format of the report enables international comparisons and provides a measurement overview of an ecosystem's capacity to accelerate digital transformation as well as its capability to integrate digital innovation into its national agenda. The Digital Innovation Profile is an accurate diagnosis of digital innovation ecosystems' health to develop strategies and inform national policies for accelerating digital transformation.

Digital Innovation Profiles offer a rapid and straightforward means of analysing and optimising an ICT ecosystem. This analysis then helps navigate through a country's fast-moving ICT/telecommunication landscape to build a competitive, sustainable, ICT-enabled economy. Further collaboration with ITU can target specific engagements, including the implementation of appropriate, co-developed, bankable projects of high value in the national context.

All Digital Innovation Profiles are developed by experts specially trained to apply the ITU Digital Innovation Framework. This framework features highly structured workshops and facilitated assessments, designed to build national capacity, enhance on-the-ground skills and powerfully accelerate digital transformation. The framework process equips ITU Members States with the tools to assess and monitor their ICT innovation ecosystems.

The analysis and the positions expressed in this initial high-level assessment reflect the opinions and research of the national expert, working within the ITU Digital Innovation Framework process, and with guidance from the ITU-D Digital Innovation Ecosystems cluster.

2. Background and Context

Key Indicators	
Population [2021]: 8,691,841	ITU Global ICT Dev. Index [2017]: Rank 55 / 176 Score: 6.61 / 10
Population Density [2021]: 100 km2	Global Innovation Index [2020]: Rank 53 / 131
GNI per capita [2020]: $ 7,600	Global Entrepreneurship Index [2018]: 74/137
Region: Southern Europe	Global Competitiveness Index [2019]: Rank 72 / 141
	Business Sophistication & Innovation [2021]: 94/132 Ease of Doing Business [2020]: 44/190

The Republic of Serbia is an upper-middle-income country located in Southern Europe, where 6.5% of its GDP comes from agriculture, 24.8% from industry, and 51.5% from the service sector. In the decade before the pandemic, economic growth averaged 1.9% annually and started to increase, averaging 4.4% in 2018–19 (World Bank, 2021). In the last few years, Serbia has enjoyed a period of economic expansion and has been one of the most successful countries in Europe at attracting investment due to political stability, low labour costs, and a strong talent pool. However, an ageing population and climate change are significant challenges, while labour shortages could significantly impair the economy's competitiveness. In response, the main political priorities include the transition to a low-carbon economy, improving education, public service delivery, promoting entrepreneurship, innovation, and digitalisation.

A long-term challenge to economic growth is population decline due to migration and a low birth rate, which further shrinks the current and future workforce. In 2018, research on student migration showed a third planned to leave the country after graduation (OECD, 2020). If current trends continue, by 2050, the population will decrease to 5.79 million (World Bank, 2020). In that same year, students in Serbia scored lower than the OECD average in reading, mathematics, and science. However, the education system has been undergoing reforms. Yet, the country shows a high literacy rate of 98.8%. Basic digital competencies, programming, and computer problem solving have become an integral part of the curriculum in schools at all levels of education. In addition, the Strategy for the Development of Digital Skills (2020-2024) aims to develop digital skills within the population necessary for everyday life, develop a successful career in the sector, and improve the knowledge and skills of ICT professionals.

The World Intellectual Property Organization (WIPO) ranks Serbia 53rd out of 131 in its Global Innovation Index (2020). A third of the governmental economic investments are in the ICT sector,

which has developed into the most substantial part of the economy and generated more than 650 million euros (10% GDP). In 2021, 81.4% of households had a broadband internet connection, and 94.6 % owned a mobile phone (Statistical Office Republic of Serbia, 2021). The Information Society and Information Security Development Strategy (2021–2026) has the overarching objective of developing an information society and citizen and business-oriented electronic government, improving information security for citizens, public administration, and businesses.

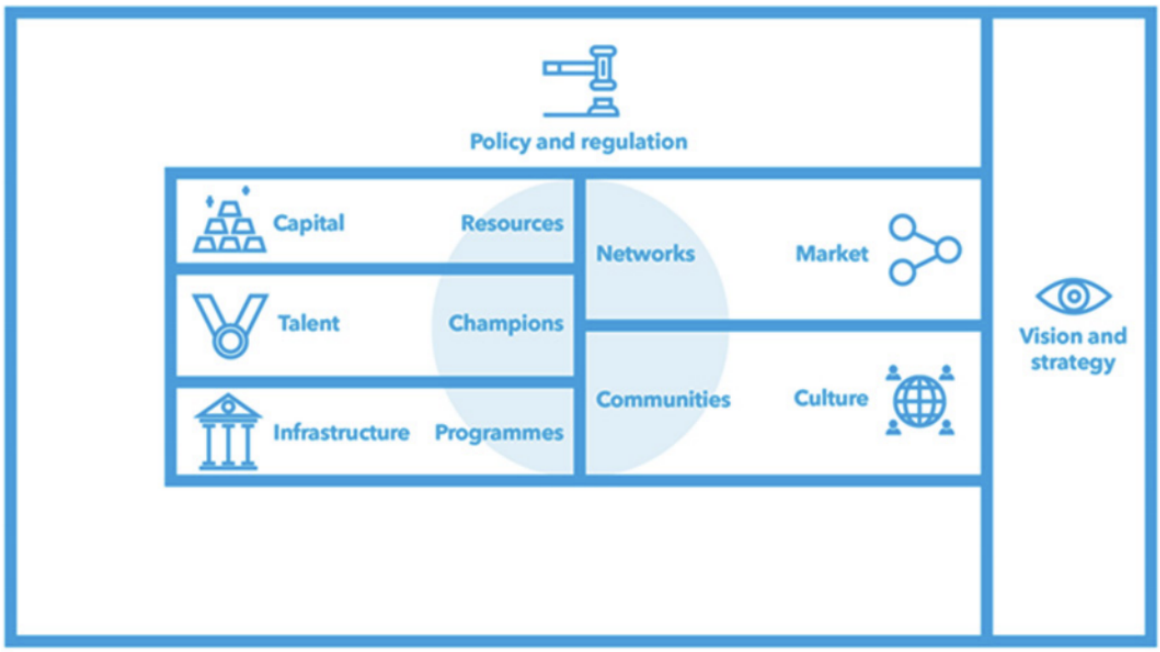
The Serbian government has allocated 65M euros for science and technology centres and has invested 70M euros in technical infrastructure to support start-ups. There are 16 telecom companies active since the liberalisation of the telecommunications sector in 2013. Operators have undertaken considerable network investment in recent years, which has boosted internet usage. Serbia has successfully established itself as a key ICT outsourcing nation, leveraging its engineering talent. However, low labour costs cannot offer a sustainable competitive advantage, leaving local companies in need to create value-added products and services. In addition, the vision of the Smart Specialization Strategy aims to establish the country as a knowledge-based innovation hub rather than an only outsourcing nation.

The Serbian private sector is dominated by energy, automotive, machinery, mining, and agriculture. In 2019, 15.61% of the employees in Serbia were in agriculture, 27.43% in industry and 56.96% in the service sector (Statistics, 2021). The formal private sector comprises only 20% of the country's population, which is too small to provide a high standard of living for all Serbians. The government invested in programmes such as "Promoting the private sector in Serbia" and launched the Innovation Fund to support growth and employment. As a result, some SMEs have improved their competitiveness and innovative capacity. Serbia ranks 44th in Ease of Doing Business, and SMEs still face challenges with labour force quality and availability, access to finance, and trading across borders.

3. Current Landscape

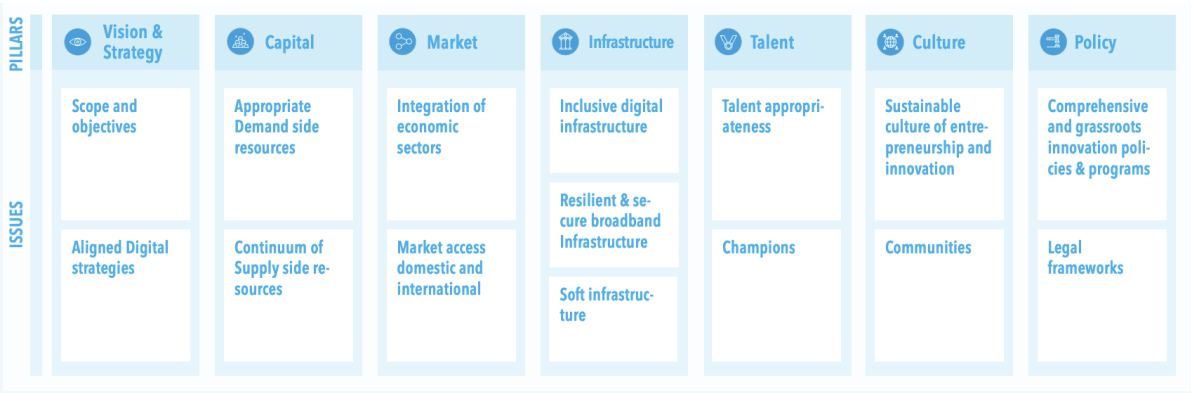
Understanding the Ecosystem Assessment Canvas: Information

Figure 1 - Ecosystem Assessment Canvas



The Ecosystem Assessment Canvas offers, at-a-glance, an overview of the seven components that make up the innovation ecosystem. It helps assess both the challenges and opportunities for the components essential to building a vibrant and innovative digital ecosystem.

Figure 2 - Ecosystem Assessment Canvas and its Related Issues



Building upon the Ecosystem Assessment Canvas, the image above presents the main issues of an enabling environment that, if achieved, can accelerate digital transformation in the economy.

3.1 Vision and Strategy

- *There is a clear national vision and strategy for digitalisation, but more could be done to maximise awareness and impact.*
- *There is a common consensus on existing issues among stakeholders but academia is left out of the loop.*
- *There is good engagement between the Prime Minister's Office and stakeholders but other parts of government may be lacking the capacity to push reforms.*
- *Local stakeholders understand their respective roles, but this does not always translate into cross-collaboration.*

Stakeholders recognise a clear government vision and strategy for digitalization, and the start-up community is high on the agenda. Digitalisation 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 Start-up strategy, the first strategy created by the ecosystem itself, with the government playing a supporting role. 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.

3.2 Infrastructure and Programmes

- *There is good access to hard infrastructure, including affordable high-speed internet but investments are needed to support the rollout of 5G.*
- *Science and Technology Parks have been created to improve access to soft infrastructure, however, they should play a more active role in entrepreneurship capacity building.*
- *There is a concentration of soft and hard infrastructure in urban areas, and rural areas need improvements in access and availability.*
- *Regional leadership in ICT outsourcing services with global potential in key sectors.*

Serbia has well-developed roads, public transport, and airport infrastructure and the second cheapest electricity prices in Europe. In addition, stakeholders benefit from high-speed, affordable internet access throughout most of the country. By 2025, the aim is for 99% of households to have broadband internet. Currently, 5G technology is not available in Serbia. The Serbian Agency for Electronic Communications and Postal Services (RATEL) will auction the allocation of frequencies for implementing the 5G network in 2022. Further investment in 5G infrastructure would help boost Serbia's global competitiveness, attract long-term investment, and grow the digital economy.

Some ecosystem players believe that more quality programs, meetups and events are required to support innovators. Soft infrastructure is clustered mainly around Science Technology Parks (STPs), start-up centres, and co-working spaces. Serbia has invested heavily in four state-of-the-art STPs in Niš, Belgrade, Čačak, and Novi Sad. These parks support start-ups and growing high-tech companies, helping them develop and commercialise innovative products and services. The aim is for STPs to become hubs and play an essential role in developing the innovation ecosystem. Linkages, cross-stakeholder collaboration, and a problem-solving focus will be the keys to their success.

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. An estimated 90,000 households and 600 schools and public institutions in rural areas will gain access to fast broadband. Startit already runs several co-working centres that help to foster entrepreneurship in smaller cities.

All ecosystem actors agree that Serbia is a strong competitor in the terms of ICT outsourcing service exports in the region. Serbia needs to focus on IT production, including its competitive strengths, gaming, and blockchain to compete globally. Gaming employs more than 2,000 people, about a third of whom are women, and generated total annual revenue of approximately €120 million in 2020 (Startup Genome, 2020). Local start-ups have made Serbia one of the top destinations for R&D blockchain-based product development. In addition, Serbia has a strong AI strategy and has established an AI Institute. The country should continue to build on these strengths and dedicate resources to these three sub-sectors to create a globally recognized IT production-based brand.

3.3 Talent and Champions

- *Excellent technical talent exists but new strategies are needed to increase capacity as the ecosystem grows.*
- *Innovators have learning opportunities through informal education but lack entrepreneurship training.*
- *There are some successful initiatives to attract and engage diaspora but more can be done.*
- *Many champions are active in the ecosystem but more start-up success stories are needed to raise aspirations.*

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 22nd for graduates in engineering and science (Global Innovation Index, 2019) and has almost 250,000 active university STEM students. Most stakeholders agree a significant challenge is increasing capacity as the ecosystem grows, which the higher education sector cannot achieve alone.

The unemployment rate of youth (15-24) is relatively high at 22.2% (Statistics Office Republic of Serbia, 2021). To address this the government has stepped in to provide free digital training for citizens including young people not in the job market. In addition, Microsoft's Global Skills initiative supported by the government and educational institutions offers an open digital education programme for ten of the most in-demand occupations. These programmes demonstrate promising results, but more stakeholder partnerships are needed to up-skill and re-skill parts of the labour force without work.

All stakeholders recognize an apparent gap in soft skills, particularly international business development, marketing, and communication. Entrepreneurship is not taught widely at universities and soft skills development is not mandatory. Therefore, larger companies train employees in-house, but this is more difficult for start-ups with limited resources. Some innovators are learning through informal education, but experienced mentors are scarce. In the short term, collaborating with international accelerators and VCs could help fill this gap, but incremental changes to the education system will not provide the speed of change required.

Following higher education, almost a third of graduates were leaving the country in 2017, contributing to the brain drain. However, since then, Serbia has been experiencing an influx of talent. The Returning Point was established to support repatriates and promote better connections between Serbia and its diaspora. To encourage the repatriation of educated people the government has introduced tax incentives. Serbia needs to build a society based on exchanging knowledge and experiences, rather than as a one-way outsourcing model. A more dramatic change in business models is necessary to create change for the industry and long-term sustainable value.

Most ecosystem actors perceive Digital Serbia Initiative, the Prime Minister's Office, Serbian Entrepreneurs, and Nordeus to be the champions supporting innovation development. Some start-ups also expressed a desire and willingness to act as role models. However, Serbia needs more start-up success stories to showcase entrepreneurship as a viable career path. The Serbian government is

beginning to address this via their upgraded Entrepreneurship Portal, which provides resources for start-ups in the country.

3.4 Capital and Resources

- *The government remains the primary provider of seed capital for innovation, but more private risk capital is needed to support the ecosystem.*
- *There are attempts to stimulate technology transfer, however, few faculties have Technology Transfer offices.*
- *The country is a world leader at attracting Foreign Direct Investment (FDI) but it also increases competition to an all-ready scarce talent pool.*
- *The National Science Fund has been established to improve the quality and relevance of research.*

All stakeholders recognize progress has been made in access to finance for innovation. The Innovation Fund supports early-stage entrepreneurship, including basic research and prototyping. To date, €31.2 million has been approved for 227 innovative projects, which are popular amongst innovators. Opportunities also exist to raise early-stage and capital investment from South Central Ventures and the Belgrade Venture Forum. Some SMEs are able to access bank loans. In 2018, new bank lending to SMEs increased by 17.2% year on year (OEDC, 2018). However, with limited angel investment and venture capital, many start-ups are unsustainable long-term. Labour is relatively cheap, enabling some entrepreneurs to build companies without outside investment, but this is a slow process that can stifle innovation. To fill the funding gap Telecom Serbia has created a 25M euro venture capital fund, and the government aims to have five new venture capital funds in 2022. In addition, the government has created tax incentives to encourage individuals to invest in start-ups and venture capital funds. The country's digital competitiveness still remains hampered by a lack of private investment.

The University of Belgrade's Centre for Technology transfer supports researchers, guiding and encouraging them to step into the world of industry and business. However, many universities in Serbia are still operating as traditional organisations without dedicated technology transfer offices and not adapting fast enough to the changing environment. Technology transfer is not yet adequate to meet the ecosystem's needs and is a fundamental challenge to development. Stakeholders state that more communication between universities and the private sector and a structured approach to technology transfer is needed. Besides academia, the Technology Transfer programme (TT programme), part of the Innovation Fund, supports local research and development organisations and other organisations that support innovation to increase their ability and efficiency in commercialising inventions. However, only 580 thousand euros has been spent in technology transfer, with unknown results.

Ranked number one globally twice in the last three years in greenfield FDI Serbia has gained an international reputation as an attractive investment destination (Financial Times, 2019). Blue-chip firms investing include Schneider Electric, Continental, Microsoft, Bosch, Michelin, Siemens, Panasonic, and AI tech specialists Wonder Dynamics and Everseen. Although FDI has been positive for

the ecosystem, some stakeholders view it as a double-edged sword. Foreign companies bring new knowledge and dynamism into the ecosystem and help raise the bar for local companies. However, domestic companies must compete for scarce technical talent.

Some ecosystem actors believe there is still a gap between scientific research and practical applications. The challenge is that most research is still theoretical rather than applied, so universities need to collaborate with firms to develop these applications. The government of Serbia established the Science Fund in 2019 to improve the quality and relevance of research. Since the beginning of its operations, the Science Fund has opened five programmes with a budget of 40M euros.

3.5 Market and Networks

- *There is a small domestic consumer market with limited demand for digital consumption but it provides a testbed for pilots*
- *Public procurement has undergone digital transformation yet remains limited for start-ups in the ICT space.*
- *Innovation networks are supported but there is no explicit or widely shared mapping of the ecosystem.*
- *Export is encouraged and supported but reforms in customs procedures and other regulatory barriers can increase competitiveness.*

Serbia has a small domestic market, with almost 20% of the population over 65 (Statistica, 2020). A key challenge for all citizens is digital literacy, but especially for this age group. Due to market size and structure, insufficient local demand exists for digital services. Unable to expand locally, entrepreneurs must focus their products and services on global markets to be successful. For some start-ups, the domestic market acts as a testbed to pilot innovations. The government and business support networks are addressing this challenge by helping companies to scale up abroad.

In 2020 the revised Public Procurement Act enabled the electronic submission of applications via a newly established portal plus improvements in the procurement process's efficiency, speed, and flexibility. Few start-ups and SMEs bid for public contracts as they still view the process as too demanding and time-consuming. Serbia has introduced an Innovation Partnership procedure to help drive innovation and start-up participation, but this is relatively new and has yet to demonstrate tangible results.

Stakeholders benefit from an abundance of innovation networks and formal business associations, with the Chamber of Commerce being the largest. Digital Serbia Initiative and the ICT Clusters represent their members at a national level and support the digital economy. These networks and clusters ensure that innovators have access to the resources and connections they need. Most ecosystem players are aware of each other, and there exists a mapping of some stakeholder groups, but there is no explicit mapping of the whole ICT ecosystem, thus limiting cooperation between players.

Trade is encouraged and supported by The Development Agency of Serbia, a government organisation dedicated to facilitating and implementing direct investments and promoting and increasing exports. Customs challenges exist, and the country is undergoing extensive reforms to consolidate a competitive market-based economy. The aim is to remove regulatory and procedural barriers to trade in goods, which, by inflating transaction costs, have been undermining competitiveness in global markets.

3.6 Culture and Communities

- *Regular events are happening across the ecosystem, but the ICT ecosystem needs to connect more to other industries through these events.*
- *Interest in entrepreneurship is increasing but fear of failure is still prevalent.*
- *Women are recognised as digital industry change-makers but are not yet equally represented.*
- *Digital expedition has been launched to address the digital divide in rural areas.*

Events organised by both the public and private sectors connect and inspire start-ups. International conferences bring the ecosystem together to share experiences, invest and collaborate. Online events connecting diaspora are helping to support ecosystem growth. However, some actors believe there is a lack of quality meetups, mentors, and events to support tangible outcomes in collaboration and business transactions. It appears that the digital sector is active in the event space but needs to connect more to other industries.

According to the ecosystem, interest in entrepreneurship has increased in Serbia. This entrepreneurial culture is spreading most amongst Gen Z, perceived as having more appetite for risk than older generations. University societies and incubators are sparking enthusiasm amongst this demographic. However, generally, in society, failure is not considered an opportunity for learning and is often stigmatised. Due to this, people are reluctant and afraid to start new ventures. Building an entrepreneurial culture for less mature ecosystems requires start-up champions to inspire others to follow in their footsteps.

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 (Statistical Office of the Republic of Serbia, 2021). 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.

Some stakeholders fear a digital divide exists in rural communities and that older generations are getting left behind. To help tackle this, the government launched the "Digital Expedition," a caravan

of digital skills, literacy, and security that visited citizens in 15 cities. Similar programmes in rural areas should be encouraged to help all citizens develop 21st-century skills.

3.7 Policies and Regulations

- *A favourable business environment exists due to regulatory reforms but more dissemination about them is needed within the ecosystem*
- *Innovation champions are recognised within the government, but some parts are still quite traditional.*
- *There are some good incentives for R&D but more education is needed to maximise impact.*
- *Tax incentives create opportunities for foreign direct investment, but improved laws for foreign exchange can push for innovation within firms*

All stakeholders recognise significant progress in the regulatory environment. Serbia aims to join the EU and its single digital market, aiming to strengthen its technological ecosystem and digital infrastructure in line with the strategic framework of the EU. Supportive policies and regulations, including easy access to work permits, regulatory sandboxes, and IP protection, provide fertile ground for the efforts of entrepreneurs. 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. A good step forward, but Serbia would benefit from communicating more about its regulations to all stakeholders.

Most players in the ecosystem see innovation champions within the Prime Minister's Office, but still perceive some parts of government to be quite traditional. The government of Serbia is addressing this by investing in the digital transformation of public administration, and transferring all personal development online to help motivate and change employee mindsets. To grow the innovation capacity of the public sector, educating the whole government administration is important.

Tax incentives are enabling the development of a knowledge-based economy in Serbia. Companies can benefit from double R&D deduction and lower tax and contributions for salaries in R&D. Corporates invest in R&D centres such as the Microsoft engineering Campus. In 2018 Continental Automotive, launched a research and development centre in Novi Sad employing 600 engineers. Some start-ups and SMEs are reluctant to take advantage due to uncertainty about how accountants and tax authorities handle them despite the incentives. Awareness-raising and education of all stakeholders are needed to maximise policy impact.

According to Financial Times, Serbia is "punching almost at 12 times above its weight" in attracting foreign direct investments and has created an attractive business environment. The Foreign Investors Council (FIC) safeguards the interests of 120 foreign companies that have invested over €36 billion and employ more than 100,000 employees in the country. However, they tend to work with more

traditional industries rather than in ICT. Having said that, one factor viewed by FIC members as a limiting factor in ecosystem development was mentioned to be the law on foreign exchange

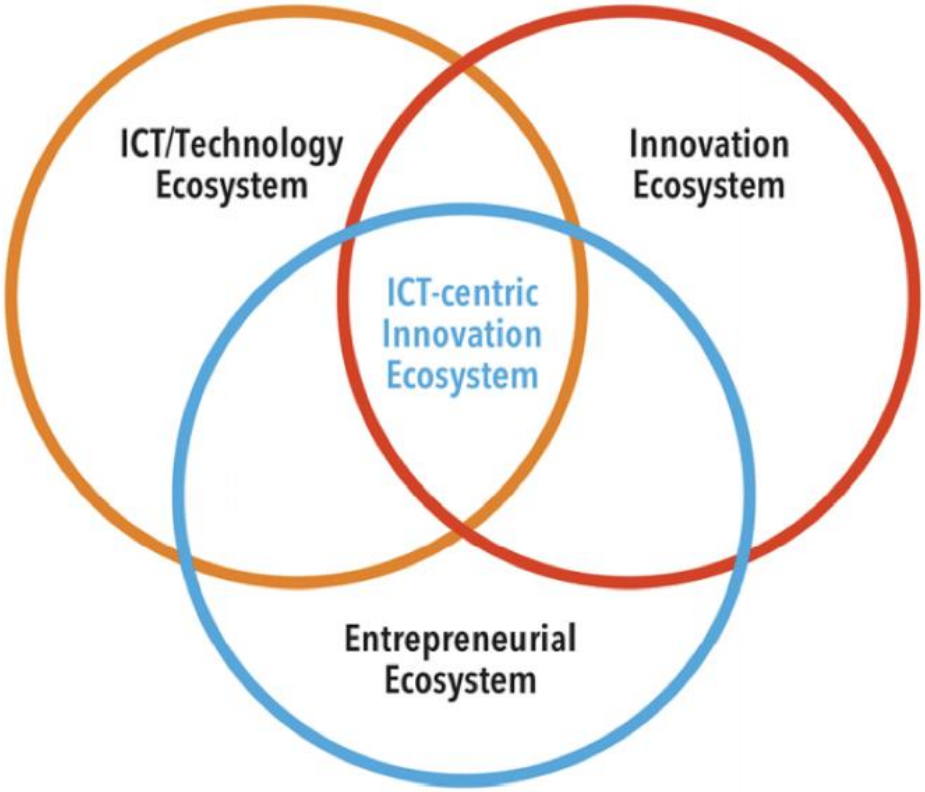
4. Challenges and Opportunities in the Ecosystem

The three main ecosystems essential to Serbia's digital transformation journey are: (i) the Innovation Ecosystem (universities, research institutes, and the public sector); (ii) the Ecosystem of Entrepreneurs (innovators and support organisations); and (iii) the Technological Ecosystem (high-tech, ICT, tech B2B, and manufacturing companies).

Understanding the ICT-Centric (Digital) Innovation Ecosystem: Information

The three ecosystems — Innovation Ecosystem, Entrepreneurial Ecosystem and Technology Ecosystem — are closely linked to developing a country's digital transformation landscape. At the intersection of the three ecosystems lies the ICT-Centric Innovation Ecosystem, also known as the Digital Innovation Ecosystem.

Figure 3 - Engines of Growth



The following section contains a brief analysis of each of the three ecosystems, and ends with a macro overview of the challenges and opportunities in the three interconnected ecosystems. Detailed analysis of the challenges is mentioned previously under the Current Landscape while the detailed recommendations are included later in this report.

4.1 Innovation Ecosystem

The Innovation Ecosystem — including research institutes, universities and public sector entities such as national innovation agencies and public sector funding — plays an invaluable role in the national journey of innovation, especially in the launch of an innovation.

Serbia's national ecosystem is organised and supported by a clear digital vision and strategy. The government has evolved a three-pronged approach to digitise public administration, the economy, and education. A lack of trust in the digital world still poses a major challenge for the government. In addition, citizens and established businesses do not understand the benefits of ICT. The national development of 21st-century skills is a governmental priority, but substantial efforts are needed to normalise digital services at a societal level.

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.

The quality and relevance of education and training do not fully meet labour market needs. Academia is struggling to attract and retain world-class professors and researchers due to being unable to compete with private-sector salaries. Exacerbating this problem, some companies incentivize professors to work with them, which further depletes teaching resources. Universities are beginning to introduce entrepreneurship courses to students, but more are needed. Although digital literacy creates new opportunities for young people, soft skills still are vital for ecosystem development. Integrating work placements into degree courses is recommended to expose students to real-world situations and develop these skills.

4.2 Entrepreneur Ecosystem

The Entrepreneurial Ecosystem includes entrepreneurs, their support systems and organisations that initially nurture business creation through the "valley of death" and subsequently their growth into SMEs.

The entrepreneurial ecosystem includes 200-400 start-ups in Belgrade and Novi Sad (DSI,2019). Although relatively small, it is growing at a fast pace. Based mainly in Belgrade and Novi Sad several prominent organisations and programmes support the start-up ecosystem. Investment in public support programmes and infrastructure has begun to create a fertile ground for innovation. Still, they do not provide all of the capital and education resources entrepreneurs require to realise their ambitions.

A significant challenge is access to growth funding, which is even more apparent because more than 50% of start-ups are entirely self-funded (DSI, 2019). Many start-ups follow a bootstrapping strategy to achieve their goals using self-sustaining resources, which slows down innovation and commercialization. At present, there are only a few options to secure external funding, and these are focused mainly on early-stage start-ups. The lack of local investment opportunities pushes some companies to seek international funding. However, the Serbian government is trying to attract angel investors and venture capitalists to fill this gap.

Lacking previous start-up experience and entrepreneurial education, start-up founders struggle to traverse the valley of death. Solid marketing and business skills are vital for scaling start-ups. Higher education curricula need to be modernised to build digital expertise, including fintech, blockchain and global digital marketing and business models (DSI, 2019).

4.3 Technology Entrepreneur

The Technology Ecosystem includes high-growth tech companies, their equipment manufacturers, systems integrators, companies in the ICT sectors and B2B technology platforms supporting SMEs, among others. The development of the Technology Ecosystem is essential to a country's ability to benefit from technological innovation and create high-growth industries and jobs.

The technology ecosystem is the newest in Serbia and dominated by large foreign multinationals and comprises telecommunication companies, systems integrators, and a few ICT businesses and start-ups. According to the Commission for Protection of Competition, over 2,500 enterprises operating in the ICT sector in 2019, employ more than 28,000 workers. Local tech companies produce products for agriculture, online games, and testing. Initially, firms outsourced their coding services due to their large English-speaking cost-effective workforce.

Blue-chip companies such as Microsoft, IBM, Intel, NCR, and Seven Bridges have either established development centres or have outsourced work to local firms. It appears that foreign companies are engaging with what the local tech scene has to offer, and there are opportunities for local firms to collaborate with big players. In this context, this ecosystem is primarily driven by international technology companies with modest local value chain integration. This ecosystem development is critical to Serbia's ability to leverage technological innovation and create high-growth industries and jobs. To achieve a mature technology ecosystem, domestic SMEs need to be more integrated into the ecosystem.

4.4 Macro Challenges and Opportunities

At a macro level, the three ecosystems face some common challenges.

- *Firstly, insufficient growth funding is a major challenge for the start-up community in Serbia, directly impacting ecosystem development.*

- *Second, access to appropriate human capital is a challenge for all ecosystems as they compete to recruit the best talent and lack the soft skills necessary to exploit digital technology.*
- *Third, the lack of a technology transfer is impacting the commercialization rate of innovative digital solutions.*
- *Finally, there is a lack of entrepreneurial culture and a need to normalise digital services at a societal level to drive the ecosystems.*

The digital markets of gaming, blockchain and AI are seen as markets of opportunity. AI and blockchain may have some commercial viability in Serbia today, but the country must become an innovation producer to reap the most benefit from technological diffusion. The country's readiness to leverage this technology to create needed solutions is critical to economic growth and high-value job creation.

5. Relevant Practices

During the assessment process, the following practices were identified as noteworthy and potentially positive for the digital innovation ecosystem. As the next step in this process, an in-depth collaborative analysis could lead to the recognition of champions and good practices throughout the ecosystem.

Belgrade Venture Forum

Belgrade Venture Form has gathered thousands of investors, corporate executives, and start-ups in the last decade. They have created a unique network that spans more than 30 countries and four continents. This carefully curated network gathers together to showcase, invest, exchange, grow and enjoy the unique spirit of the Balkans. In 2021, the conference moved online for the first time and was truly global: the East met the West, virtually in Belgrade. Serbian Venture Network (SeVeN), an association committed to developing the start-up and entrepreneurship ecosystem in Serbia and South-East Europe, manages the annual event.

Biosense Institute

Founded in 2015, BioSense, Research and Development Institute for IT in biosystems, is a pioneer in the digital transformation of agriculture in Serbia. Exploring scientific and technological frontiers regarding the application of IT in agriculture, the Institute strives to deliver state-of-the-art digital solutions to the farming sector in Serbia and the world to ensure higher yields with smaller investments. There is strong industrial cooperation and a significant track record in innovation acceleration activities, with more than 50 SMEs funded through their programmes. In addition, the Institute has participated in 30 national and 50 international projects, mainly from the European Union's Research and Innovation Program. Biosense is a member of the State University of Novi Sad.

Digital Serbia Initiative

Digital Serbia Initiative is a non-profit, non-governmental organisation with the strategic goal of developing a strong, globally competitive digital economy in Serbia. Founded by the leading digital players in the country, they combine the forces of more than 30 member-organisations from all sectors relevant for the growth of a digital ecosystem – including tech, banking, and finance, telco, consulting, legal, education and research, media, pharmaceutical, and start-up support organisations. They aim to create a business environment that serves the digital economy by investing in strategic programmes in formal and informal education, start-up ecosystem development, legal and regulatory frameworks, digital infrastructure, and public dialogue on digital transformation.

Innovation Fund

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, 31.2M euros have been approved for 227

innovative projects, 3.2M euros for 632 innovation vouchers, and 580k euros for support in technology transfer. More than 3,380 applications for projects were submitted to all public calls.

Serbian Entrepreneurs

Serbian Entrepreneurs is an apolitical, non-governmental, non-profit organisation. Successful entrepreneurs of Serbian descent founded it in Silicon Valley in 2016. They promote entrepreneurship by empowering the pay-it-forward activities of their 75 referral-based members. Accomplished founders, investors, engineering leaders, and start-up executives have formed a deeply vested network. Monthly meetings provide learnings, operations, networking, and investment platforms in founding city chapters: San Francisco and New York. They are expanding to Los Angeles, California, and Novi Sad, Serbia.

6. Stakeholders

Understanding the Stakeholders: Information

Collaboration between key actors in the innovation ecosystem is the foundation of the assessment process and drives the actions taken to build the ecosystem.

As such, being able to identify and engage with these stakeholders is an important part of the country review.

The six actors, described in detail below, are as follows: entrepreneurs, public sector actors, financial actors, academics, private sector actors, and entrepreneurial support networks.

Here is a sample of relevant stakeholders who were interviewed for this analysis:

	Stakeholders (in alphabetical order)
Entrepreneurs	• EDC.rs • HTEC • Seven Bridges Genomics • Strawberry Energy • Vega IT
Entrepreneurial Support Networks	• Chamber of Commerce of Serbia (Centre for digital transformation) • Digital Serbia Initiative • ICT Network Serbia • Science Technology Park
Private Sector	• Continental • Foreign Investors Council • Microsoft • Philip Morris • Serbian Entrepreneurs
Academia	• Artificial Intelligence Institute • Biosense Institute • Faculty of Organisational Sciences

	• ICEF University of Belgrade • Institute of Molecular Genetics and Genetic Engineering (IMGGE), University of Belgrade
Public Sector	• Ministry of Health • Office of the Prime Minister • Office for IT and e-Government • Returning Point • UNDP Accelerator Lab
Finance	• Belgrade Venture Forum • Development Agency of Serbia • Innovation Fund • OTP Bank • South Central Ventures

7. Ecosystem Maturity Map

Understanding the Ecosystem Maturity Map: Information

The Ecosystem Maturity Map, also known as the Innovation Journey Map, highlights the work that needs to be done within the ecosystem to harness innovation on a transformative journey from pre-ideation to high growth. It describes each stakeholder's roles and inputs in support of entrepreneurs and innovators at each stage of the start-up lifecycle. The colour coding identifies areas which are well-supported (green), inadequate (yellow) and missing or weak (red).

There is a need for a comprehensive understanding of how ecosystem actors can work together to implement national development priorities. Otherwise, many resources will be wasted if initiatives are constructed in silos.

The Ecosystem Maturity Map in Serbia shows an ecosystem in a **developing** state. Profiling key stakeholder actions are necessary to accelerate digital transformation.

Actors	Cycle Stage				
	PRE-IDEA	**IDEATION**	**START-UP**	**THE "VALLEY OF DEATH"**	**SME**
Entrepreneurs	Entrepreneurial Interest	Engage with Problems	Develop Business Models	Build Collaboration	Expand
Finance	Research Funding	Seed Funding	Angel Investment	Venture Capital	Business Finance and Loans
Entrepreneurial Support	Entrepreneurial Events	Hackathons and Competitions	Co-Working and Support	Incubators and Accelerators	Business Associations
Private Sector	Success Stories	Research Programmes	Lab Programmes	B2B & Support Services	Skill Training Programmes
Academia	Community of Entrepreneurs	Basic Research	Spin Offs	Soft Skill Trainings	Human Capital
Public Section	Vision and Strategy	IP & R&D Support	Tax Support	Public Procurement	Trade Policy

7.1 Entrepreneurs

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 high-profile $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 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.

7.2 Finance

In Serbia, funding for entrepreneurs is available at the pre-idea and ideation stages. The Innovation Fund supports early-stage entrepreneurship in terms of basic research and prototyping. However, a gap exists at the start-up phase as business angels are present but not in a structured, systematic way. This makes it difficult for entrepreneurs to access capital and either must bootstrap or abandon their idea. Generally, Serbia does not have a culture of individuals investing risk capital to support entrepreneurs. Crowdfunding is present but not on a large scale. The government has created tax subsidies to make it attractive to invest in start-ups. However, it will take some time for mindsets to change and the benefits to become apparent.

South Central Ventures and the Belgrade Venture Forum provide opportunities to raise early-stage and capital investment funds. However, the venture capital scene is still fairly rudimental, which means companies struggle to cross the valley of death. Successful firms generally attract VC funding from abroad and exit the ecosystem. Valuable business skills and talent are often lost, which hinders ecosystem growth. To encourage talent back to the ecosystem Serbia is engaging with the diaspora and has created initiatives to make returning to Serbia attractive. To grow, attracting more venture capitalists and business angels needs to be a priority for the finance sector.

7.3 Entrepreneurial Support

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.

7.4 Private Sector

At the pre-idea stage successful entrepreneurs help to inspire, mentor and fund new entrepreneurs through diaspora networks such as Serbian Entrepreneurs. There are also personal initiatives by some private sector leaders, but a formal angel network needs to be established to accelerate ideation. Success stories are visible but limited due to Serbia having a relatively young digital innovation ecosystem. More initiatives are required to raise the profile of entrepreneurship in society by sharing stories of both success and failure.

Attempts are being made to develop corporate accelerators to help innovators access finance as well other promising start-ups. For example, Philip Morris International is currently delivering a three-year programme called StarTech to support the digital transformation of SMEs in cooperation with the government of Serbia. Due to the success of FDI initiatives, the corporate sector has a high number of foreign firms. Competition for the best technical talent is a challenge for the public sector and start-ups as corporations can offer better remuneration. To help more start-ups cross the valley of death, larger private companies could set up corporate accelerators as part of their CSR policy or act as angel investors and help to fill the funding gap.

7.5 Public Sector

The public sector has adopted a leadership role in developing the digital ecosystem. There is a clear vision and strategy for digitalization that all stakeholders can embrace. The government has implemented a generous taxation framework that supports entrepreneurship, including attractive research and development exemptions. Despite this, not all companies are taking advantage partly due to a lack of awareness and mistrust of tax authorities' treatment of incentives. Educating both accountants and the tax authority is essential to increase uptake and drive innovation.

Reforms have made public procurement more accessible and transparent, and quite a few public sector IT projects are developed by private vendors. However, stakeholders feel that more can be done to provide opportunities to start-ups. Foreign trade is well supported, and ICT services are Serbia's largest net exporter. The country has free trade agreements with the EU and Russia and preferential agreements with many countries, including the USA, Japan, and Turkey.

7.6 Academia

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 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.

8. Perspective on Priorities

The high-priority objectives for the ICT-centric innovation ecosystem, formulated from the workshop with the main stakeholders of the ecosystem, are presented below

<table>
<tr><th colspan="3">Common Vision</th></tr>
<tr><td colspan="3">Serbia’s vision is to create a full-digitised economy with a knowledge-based international innovation hub retaining top technical talent and creating globally competitive industries with ICTs as a driver of innovation.</td></tr>
<tr><th colspan="3">Strategies</th></tr>
<tr><td colspan="3">The implementation of digital strategies that enable the development of advanced value-added services and benefit populations, based on:
● A digital economy driven by research and development
● Creating high-value digital jobs and retaining talent,
●Competitiveness for the key economic sectors carrying the economy (energy, automotive, machinery, mining, and agriculture), for the new digital sectors, for the social sectors (education and health) extended to all regions.</td></tr>
<tr><th>Economic</th><th>Social</th><th>Political</th></tr>
<tr><td>Digital strategies for the competitiveness of key economic sectors carrying the non-ICT economy (energy, automotive, machinery, mining, and agriculture).</td><td>Digital strategies for the development of high-value digital jobs for all to retain top technical talent.</td><td>Digital strategies that support and promote collaborative research and development, technology transfer, and provide open access to data.</td></tr>
</table>

Catalysts[2]					
Six groups of interdependent catalysts are needed to deliver a new digital vision in Serbia. They help develop and mature the digital ecosystem and align vision with strategies and actions.					
A review of digital policy implementation and incentives to accelerate uptake.	Establishment of 5G infrastructure.	Implementation of flagship projects, development of key sectors and access to the market and network.	Establishment of a mapping of actors and existing resources.	Setting up support frameworks for effective entrepreneurial education programmes and events and the development of digital communities.	Establishment of a knowledge-based innovation hub equipped to monitor public and private flagship projects.
Project: Review of effectiveness of digital policies and incentives.	***Project: Infrastructure for 5G digital innovation.***	***Project: Initiatives for key sectors.***	***Project: Digital ecosystem mapping.***	***Project: Support programme for innovators.***	***Project: Innovation centre for digital transformation.***

9. Key Performance Indicators

The strategic vision and recommended programme must address the systemic challenges that hinder the development of the digital ecosystem and its impact. To this end, the table below demonstrates how the recommendations can lead to a credible, measurable, and inclusive impact.

This table is based on the theory of change. This theory is generally used as a planning tool in the innovation cycle, as a way of showing how actions taken lead to change in the short, medium, and long term. It is generally used as a strategic tool for the development of social and sustainable projects but also to measure the concrete impact of government actions.

Desired Impact

Serbia's vision is to create a full-digitised economy with a knowledge-based international innovation hub retaining top technical talent and creating globally competitive industries with ICTs as a driver of innovation.

Indicators: Improvement of SDG indices: 1,2,4,5,8,9,10,11,12

Long-term results	Medium-term results	Short-term results	Recommendations[3]*
The general environment is favourable for innovation and entrepreneurship in ICTs. *Indicators:* *Improvement of GII, IDI indices* *Improvement of GCI indices* *Improvement in Ease of Doing Business ranking*	The various regulatory tools, mechanisms and supports are operational and effective. *Indicators:* *Impacts of regulatory tools, mechanisms and operational support improved.*	A review of digital policy implementation and incentive utilisation to accelerate uptake. *Indicators:* *Increased stakeholder awareness of tax incentives and virtual currency and digital tokens.*	DI 1,2,3

A fully developed and deployed countrywide 5G infrastructure. *Indicators:* *5G access and subscriptions across the whole country.*	Recommendations on development and partners of 5G infrastructure are operational. *Indicators:* *Number of recommendations being implemented and number of partners selected.*	Recommendations on the development of 5G infrastructure are in place. *Indicators:* *Number of recommendations implemented.*	CI 1,2,3
	Start-ups and SMEs can deploy their full potential and develop beyond their niche in ICTs. *Indicators:* *Number of start-ups and SME solutions active in key sectors.*	Recommendations on flagship projects, development of key sectors, market and network access are in place. *Indicators:* *Number of initiatives and flagship projects developed for innovation in key sectors.*	IS 1,2,3,4

The players are mobilised and collaborate on flagship projects and initiatives. *Indicators:* *Improvement of the maturity of the ecosystem.*	The measures and mechanisms to search for information on the ecosystem are operational. *Indicators:* *All stakeholders are informed of and aware of the activities and resources in the ecosystem.*	A mapping of actors and existing resources are in place. *Indicators:* *Number of mechanisms put in place for development and information research.* *Collaborations between public and private sectors.*	RE 1,2
	The mechanisms and measures allowing the development of digital communities are operational. *Indicators:* *Stakeholders work together to achieve the shared vision.* .	Support frameworks for entrepreneurial education programmes and events and the development of digital communities are in place. *Indicators:* *Number of initiatives for entrepreneurial education, collaboration, networking and information sharing.*	KE 1

	Mechanisms and measures to promote new models of public and private partnership are operational. *Indicators:* *The necessary resources exist with sound governance for the initiatives.*	Establishment of a knowledge-based innovation hub equipped to monitor public and private flagship projects. *Indicators:* *Appropriate governance with a structure equipped to support initiatives.*	PE 1,2,3

10. Next Steps

Decisive and active interventions can help transform an ICT ecosystem, making it more innovative and a true driver of accelerated digital expansion in all aspects of society — with real gains in public, professional and personal lives.

Stakeholders, based on co-creation and ecosystem priorities, shared recommendations that have helped conceptualise the following priority projects.

The value of this assessment — which identifies the main obstacles and catalysts that already exist in the ecosystem — is to provide the ideal platform for the launch and development of high-impact flagship projects. Each of these projects, designed to be of unique relevance to the country, would help accelerate digital transformation.

As a next step, further engagement is needed to generate a more in-depth assessment to support the creation of a fundable project document. This Digital Innovation Profile provides a valuable first glimpse of both the ecosystem and the existing practices. The profile is designed to raise awareness about the local challenges and opportunities, and engage all stakeholders in implementing flagship projects — which can foster an enabling environment for the ICT-centric innovation ecosystem — to unleash the full potential of Serbia, and ultimately help bridge the innovation gap.

Appendices

APPENDIX 1: Detailed Recommendations

These recommendations are inspired by the Co-Creation Workshops in which all stakeholders participated.

Type	Recommendation	Sub Recommendations	Actions	Direct Key Performance Indicator
DI-1	Creation of new sustainable financial support for the digital ecosystem.	● Incentive for the development of risk capital - Specialised funds for social impact.	● Establish and leverage incentives to stimulate private investment so that large companies can invest in the development of innovative services in sectors that contribute to the development of society.	● A number of funds created for key sectors (tourism, agriculture, wood sector and textile sectors).
		● Incentives for collaborative academic research and development (R&D).	● Establish an incentive programme and support for academics to collaborate with industry.	● Number of funds available for university collaborative ICT research as well as recognition of their effective distribution.

		• Incentives and support for the development of a formal and structured network of angel investors.	• Review best practice examples including SEIS and SFC programmes, in the UK. • Establish a programme to develop an angel investment network. • Work with the Business Associations and stakeholders to promote the scheme.	• A loan programme for investments in start-ups in the digital sector. • A support programme for the development of angel capital. • Number of start-ups and investors registered with the scheme. • Number of local investments made.
DI-2	Revise or strengthen ICT laws.	• An operational framework for the use of electronic signatures.	• Operationalize the electronic signature law to accelerate business facilitation in Serbia.	• The law is operational, and the government administrations are the first users.
		• A review of the effectiveness of National Open data policy.	• Review of data management in public institutions	• Number of open data-driven solutions created • Increased awareness of the importance of open data in wider society.

		● A review of customs policy and procedure in relation to ICT hardware imports and exports.	● Analysis of administration process and waiting times at borders.	● Smooth and efficient process with a reduction in border waiting times. ● Increase in ICT hardware exports in Gross value added (GVA).
DI-3	Strengthen support for innovation and intellectual property.	● Create increased intellectual property support capacity for digital innovation.	● Establish a programme to inform and support start-ups in the protection of their innovative solutions. ● Establish a programme to educate and support accountants and tax offices in R&D tax regulations.	● A programme is established at the level of an appropriate local structure. ● A programme for accounts and tax offices is established.
CI-1	Create high-speed infrastructure to support innovators across the country.	● Develop a fully operative and countrywide 5G network.	● Engage with and support telecoms providers to develop 5G infrastructure.	● Fully operational and countrywide 5G network. ● Numbers of subscribers to 5G network.

CI-2	A digital education that gives citizens the soft skills necessary for entrepreneurship.	● A review of the school curriculum and programmes to materialise the achievements of talents.	● A review of the school curriculum and appropriate programmes is carried out.	● Entrepreneurship programme integrated into the school curriculum starting from elementary level.
		● Promote entrepreneurship in tertiary education.	• Create a framework to support entrepreneurial training and the promotion of entrepreneurial colleges and universities.	• A framework is established for entrepreneurial training and the establishment of entrepreneurial colleges and universities.
		● Create programmes for entrepreneurship and the promotion of creativity.	● Promote the curriculum for the education of technology-based entrepreneurship in tertiary structures.	● A programme is established to make practical tool kits for entrepreneurship available. ● Introduce a specific module on financing and equity options for start-ups. ● A course programme is established at the university level for entrepreneurship as a diploma.

		● Scale ICT competitions and hackathons across all colleges and universities.	● Engage with incubators and support networks to organise and host events. ● Identify ICT and entrepreneurs experts to support events. ● Create start-up role models and success stories.	● Number of events per year. ● Number of participants and ideas generated. ● Number of ideas that register as start-ups.
		● Introduce an internship programme for all business-based degrees to develop soft skills.	● Engage with the local business community to provide digital placement opportunities.	● Number of student placements and Serbian companies engaged.
		● Promote a systemic approach to collaboration with businesses.	● Create a programme to promote collaboration with the tertiary sector, and public and private companies.	● A programme is established with incentives and a framework for collaboration to develop the appropriate human resources for digital.

		● Promote public sector innovation and intrapreneurship.	● Develop a programme to promote public sector intrapreneurship.	● A programme is established for government employees to understand digital innovation. ● Number of intrapreneurship projects are encouraged and supported.
		● Develop a programme to promote the development of support networks for entrepreneurs.	● Establish an umbrella organisation for incubators to expand access to spaces and resources that stimulate innovation and develop the capacities of actors in incubation.	● An umbrella incubator is established with key initiatives within the STPs.
C1-3	Accelerate access to resources and networks for innovators across the country.	● Develop a business support programme for innovators in rural communities. ● Establish co-working spaces in small villages to encourage digital nomads.	● Develop a network of mentors responsible for the development of the ecosystem in a specific territory. ● Develop a start-up programme for over 55-year-olds in rural communities.	● A capacity-building programme for local communities has been established. ● Co-working spaces have been established. ● Number of digital nomads registered with co-working spaces.

		● Attract FDI in sustainable and green industry sectors.	● Incentives for key sectors to attract FDI to establish R&D centres within Serbia.	● Number of R&D centres established by foreign investors. ● Number of high-technology jobs created.
IS-1	Promote the global brand image: Serbia creates tech.	● Develop the “Serbia creates tech” brand.	● Establish a “Serbia creates tech” label that attributes a value to social contribution for any business based on a contribution to flagship initiatives in the digital sector.	● A Serbia creates tech label is operational and recognized as a programme.
IS-2	Acceleration of the digital transformation of value chains in sectors.	● Create flagship initiatives to accelerate the digitization of non-ICT sectors.	Create flagship initiatives that can be funded with appropriate governance that bring together a coalition of public, private, start-ups and digital SMEs.	● Flagship initiatives allowing the development of B2B services in key sectors (tourism, agriculture, wood sector and textile sectors) are established.
IS-3	Acceleration of digital transformation within state services.	● Accelerate the digitization of state-citizen services.	● Develop a strategy for a transparent digital government with access to essential state services. ● Establishment of key initiatives for the transformation of state services and a framework to	● A comprehensive strategy is put in place with essential services to be identified. ● A programme is established to provide key services.

			operationalize the many state services.	
IS-4	Promote access to the public market for innovators.	● Develop a programme that facilitates access to public procurement contracts. ● Raise awareness of the Innovation Partnership procedure.	● An action programme to ensure that a minimum percentage of public market contracts are awarded to SMEs and start-ups. ● Government to become first users of innovative solutions and help start-ups export.	● A public access programme is operational. ● The number of innovative solutions used by public sector entities.
RE-1	A mapping of the ecosystem and the actions of the stakeholders is to be established.	● Create a platform that includes a mapping of ecosystem actors, resources, opportunities and activities.	● A directory through a digital platform that provides information on ecosystem actors, resources, opportunities and activities. ● Ecosystem actors have the means to disseminate any useful information relating to the development of entrepreneurship focused on digital innovation.	● An established platform serves as a one-stop-shop for access to information, resources, events and communication of ecosystem activities. ● Concrete actions have been initiated to raise awareness of the consumption of digital innovation.

RE-2	Develop and disseminate accessible knowledge of ecosystem resources.	• Support programme for ecosystem events.	• Establish a programme for systemic support for events that bring together actors or support the development of digital communities. • Create international ICT events focused on specific topics to enhance the quality of outcomes and B2B matches.	• A programme is established with funding available and distributed for high-quality events. • Stakeholders accountable for follow-up and measurable achievement of key measures.
KE-1	Create support frameworks for events and the development of digital communities.	• Promotion and awareness campaign.	• Establish a programme for the promotion of the digital sector in general and start-ups in particular. • Create a national TV series to promote entrepreneurship.	• A programme is established with specific results regarding promotional goals. • A national TV series for entrepreneurship is launched.
PE -1	Strengthening networks and associations	• Strengthen the capacity of digital start-up ambassadors.	• Establish a programme to create mandate-driven digital ambassadors based on criteria and specific products and services they provide to the ecosystem.	• A digital ambassador programme is created. • Number of active digital ambassadors.

PE -2	Establishment of an accelerator for digital transformation to strengthen collaboration, trust and the development of flagship projects.	● Ensure the development and monitoring of flagship projects in order to attract national and international investors.	● Efforts to ensure that initiatives can be capitalised and shared. ● Engage diaspora as mentors and investors.	● Number of start-ups on the accelerator programme. ● Number of diaspora citizens engaged in mentorship and investment.
PE-3	Develop technology transfer partnerships.	● Create more support for technology transfer with university faculties. ● Raise awareness of tech transfer within academia and industry.	● Review tech transfer activities, resources and outputs from university faculties. ● Develop a more structured approach to knowledge and tech transfer.	● Establish a central hub and spoke model for tech transfer offices at universities. ● Number of tech transfer offices. ● Number of collaborative tech transfer projects.

APPENDIX 2: Methodology

This study was carried out using a global comparative framework developed by the ITU for the diagnosis and development of ecosystems centred on ICTs. The analysis of a country consists of five steps, which aim to reduce the disparities in digital innovation using a practical kit to strengthen ICT-centric ecosystems that allow defining of common objectives, diagnosing the ecosystem, formulating recommendations, setting up an implementation framework and proposing a monitoring and evaluation method.

The toolkit for strengthening ICT-centric ecosystems is available here: bit.ly/DIPpolicykit

Building on ITU's innovation toolkit series, another toolkit shares more insights on how stakeholders can undertake rapid ecosystem diagnosis, establish key recommendations, and develop flagship projects that effectively nurture ICT-centric innovation within their digital ecosystems.

The toolkit for developing sustainable ICT-centric projects is available here: bit.ly/DIPtoolkit

APPENDIX 3: Key Words, Definitions, Acronyms, and Abbreviations

Key Word	Definition
Vision	The vision defines an ideal to be achieved after a given time. Its objective is to mobilise the stakeholders for its realisation while giving the necessary direction to obtain the desired situation.
Strategies	A strategy defines the main axes to be developed in order to obtain the objectives and results towards the vision. The transformation of value chains for each sector with the contribution of digital technology is one of the major research objectives. The strategies should also define the roles and responsibilities of non-digital actors and how their contributions reinforce the defined objectives or sub-objectives. Four pillars of strategies are proposed for sustainable development: political, social, economic, environmental. For each strategy to be developed, it is recommended to develop a theory of change which unites and measures the contributions of the actors.
Catalyst - Dynamics of innovation (DI) with digital technology	Measures that allow innovation to exist. They support the general environment for innovation. A dynamic innovation environment needs a coherent regulatory and organisational framework that guides, encourages and fosters a culture of innovation, mind-set, projects and programmes.
Catalyst - Capacity for innovation (CI) with digital	Measures that make it possible to have sufficiently developed infrastructures and talents within the ecosystem, which will be conducive to digital transformation. They give innovators the tools, skills, spaces and know-how they need to be successful.
Catalyst - Innovation in key sectors (IS) with the contribution of digital	Measures that integrate innovation in key sectors, so that start-ups and SMEs can unleash their full potential and expand beyond their niche, making transformation in other sectors possible.
Catalyst - Research in the digital ecosystem (RE)	Measures and mechanisms to search for information on the ecosystem, in particular the mapping of actors and existing resources.
Catalyst - Knowledge sharing in the digital ecosystem (KE)	Mechanisms and measures to share knowledge to accelerate the mobilisation and collaboration of stakeholders.
Catalyst - Partnership in the digital ecosystem (PE)	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.
Theory of change and indicator development	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.

APPENDIX 5: Acronyms and Abbreviations

Key Word	Definition
BPO	Business Process Outsourcing
CSR	Corporate Social Responsibility
DSI	Digital Serbia Initiative
FDI	Foreign Direct Investment
FIC	Foreign Investors Council
GDP	Gross Domestic Product
GVA	Gross value added
ICT	Information and Communication Technologies
IP	Intellectual Property
OECD	The Organization for Economic Co-operation and Development
SDG	Sustainable Development Goals
SEIZ	The Seed Enterprise Investment Scheme
SEZ	Special Economic Zone
SME	Small and Medium Enterprises
STP	Science Technology Park
UNDP	The United Nations Development Programme
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
USF	Universal Service Fund
VC	Venture Capital
WBIF	West Balkans Investment Framework
WIPO	World Intellectual Property Organisation

[1]A post-ideation period when innovators need significant investments and a lot of support, and the risk of business failure is high.

[2] Enablers.

[3] An annex to this report exists in a separate document and details the recommendations and methodology used, as well as other information useful to the sponsor of the report.