



MONTENEGRO  
MINISTRY OF SCIENCE

# ICT (HORIZONTAL PRIORITY SECTOR)

Results of Entrepreneurial Discovery Process

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Date: initially created on 8 June 2018, revised in July, August and September 2018



## VISION

Digital Montenegro with the use of advanced ICT solutions in all sectors of the economy and developed IT awareness that enables a dynamic and proactive approach to new and innovative technologies.

## SECTORAL GOALS

- Development of human resources, legislative and technical-technological infrastructure, entrepreneurship and environment for attracting and retaining experts, creating preconditions for competitiveness in the local and global market.
- Development of globally competitive system and smart solutions in the areas of ICT application in agriculture, health and tourism, renewable energy sources, new materials and sustainable technologies, public administration, as well as in the promotion and preservation of cultural heritage.
- Support and promotion of digital economy with a view to stimulate knowledge-based entrepreneurship and thus enable greater access to the global market.

Promotion of digital economy
Development of infrastructure and entrepreneurship

## 2022 GOALS

- Increase in the number of ICT start-ups – newly established ICT companies by 30%
- Establishing at least two significant pilot projects in the field of use and testing of new ICT technologies
- Increase in the number of employees in the ICT sector by 20%

## FOCAL AREAS AND TECHNOLOGIES

### Identified focal areas and technologies that have great potential:

- New generation communication technologies (5G, SDN, NFV, GNSS, etc.)
- IoT (Internet of things)
- Virtual reality, 3D, augmented reality (VR/AR), 3D
- Digital transformation (ERP systems, e-commerce, financial technologies, etc.)
- Blockchain technology and cryptocurrency
- Big Data, Cloud – services
- Video games as a model of support to other sectors
- IT systems security
- Smart technologies (cities, buildings, etc.)
- Green ICT (reduction in emissions, energy savings, etc.)



- Machine learning and artificial intelligence

## EMPIRICAL FOUNDATIONS AND COMPETITIVE ADVANTAGE OF MONTENEGRO

In Montenegro, ICT has become necessary and present in all other priority areas of development, as well as in all economic and social aspects of life, accounting for 6% of GDP with a growth tendency. ICT is developing in the context of the improvement of information systems in public administrations, education, industry and health, all in line with modern technological trends and Industry 4.0. ICT infrastructure in Montenegro is at a satisfactory level and is ranked 39<sup>th</sup> in the world<sup>1</sup>, with intensive use of software and ICT services identified. In Montenegro, 98.4% of surveyed companies<sup>2</sup> (2017) are using computers in their business, while about 40% of them employ ICT experts, which is a 2.6% growth compared to 2016. When it comes to the Internet, about 75% of companies have their web presentation, which is 1.8% more than in 2016.

In recent years, an increasing number of small companies engaged in the development of software and software products have appeared in the IT market, and so have self-employed software engineers, freelancers, digital project managers, digital marketing managers, designers and other profiles that engage in the global IT market. Software engineering has already experienced significant development and has begun to stand out as a separate economic branch that is not limited to the capabilities of the domestic market. In Montenegro, there are higher education institutions within the state-owned and private universities that produce ICT professionals in the field of software engineering.

As for the “C” segment of ICT, it is dominated by three international operators of fixed and mobile telephony, which provide modern communication services to mobile cellular networks, optical communication systems and DSL subscriber lines. The existence of modern telecommunication infrastructure is the basis for the development of many other economic areas and the entire society.

## SYNERGISTIC EFFECTS IN RELATION TO OTHER PRIORITY SECTORS

	<b>ICT (horizontal priority sector)</b>
<b>Sustainable agriculture and food value chain</b>	<ul style="list-style-type: none"><li>• Smart and efficient agriculture management (from field to table)</li><li>• Application of sensors for monitoring healthy food and the environment (bio-sensors, smart buoys, etc.)</li><li>• Centre of Excellence</li></ul>
<b>Renewable energy sources</b>	<ul style="list-style-type: none"><li>• Smart transport of energy and information</li><li>• Green ICT</li><li>• Optimal management of the EES and networks</li><li>• Energy and data transmission</li><li>• Managing data for smart use of energy sources or engaging network capacities</li></ul>

<sup>1</sup> The Global Innovation Index 2018

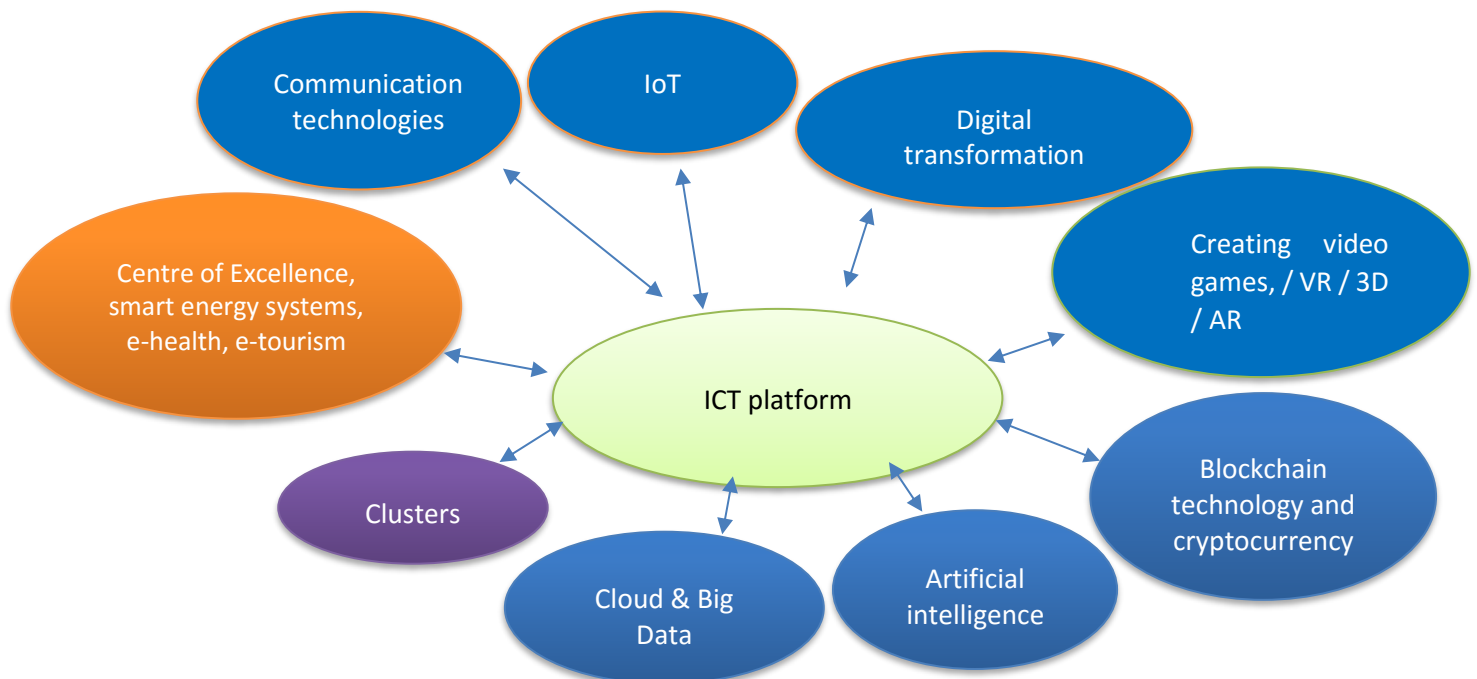
<sup>2</sup> Use of ICT in enterprises in Montenegro, 2017 – MONSTAT



	<ul style="list-style-type: none"> <li>• Cyber security</li> <li>• Smart energy systems – smart energy and data transport</li> <li>• Smart trading and electricity management – energy market</li> <li>• Management of data on energy research on the state and potential in energy</li> <li>• Development of a business intelligence system in energy</li> </ul>
<b>Health and sustainable tourism</b>	<ul style="list-style-type: none"> <li>• E-health services</li> <li>• E-platforms and tourist services</li> <li>• Montenegro as a high-level tourism model – relying on ICT</li> </ul>
<b>New materials and sustainable technologies</b>	<ul style="list-style-type: none"> <li>• Efficient management of production facilities through the use of ICT</li> <li>• 3D printing</li> <li>• Dynamic signaling and lighting</li> <li>• Smart homes and smart cities</li> <li>• VR technology for the presentation of construction projects</li> <li>• Industry 4.0</li> </ul>

## PROPOSED ICT PLATFORM

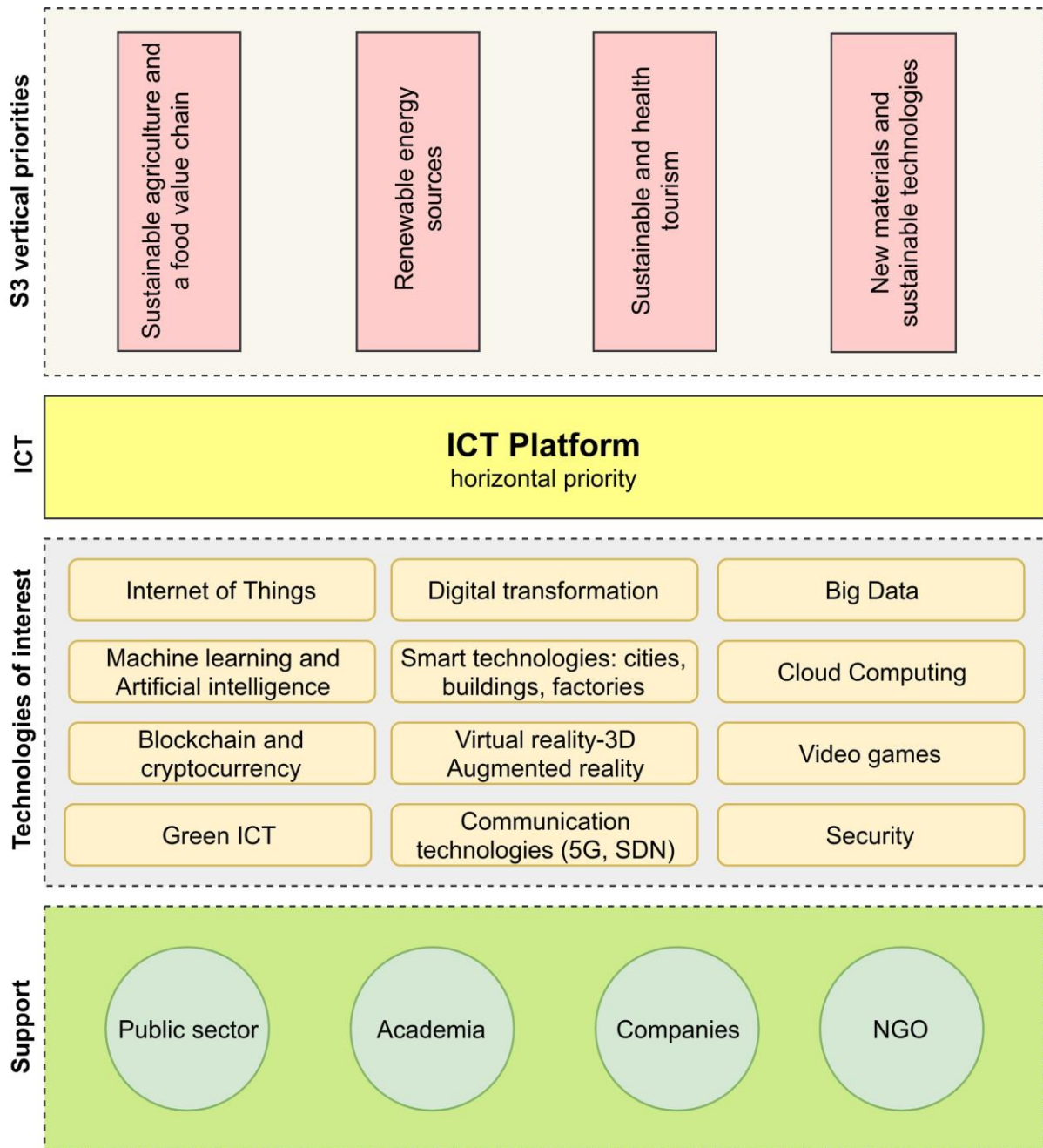
HORIZONTAL AND VERTICAL DIMENSIONS



The Ministry of Economy and the Ministry of Public Administration, along with the Chamber of Economy of Montenegro and other relevant public sector institutions, supported by ICT and multidisciplinary clusters, are crucial for the implementation of ICT platform because in addition



to designing and implementing the ICT strategy they enable the implementation of other strategies in priority areas and shape the process of digital transformation of the Montenegrin economy by increasing competitiveness.



## SWOT ANALYSIS

### STRENGTHS

- Good telecommunication infrastructure
- The presence of large international companies in the field of ICT
- Small country size, suitable for the application and testing of new technologies
- High percentage of penetration of mobile telephony



- Possibility of efficient mutual linking of different ICT profiles or association of ICT companies in Montenegro

## WEAKNESSES

- Undefined jurisdiction of state administration for the field of IT
- Lack of support for companies for the digital transformation process
- Education is not at an adequate level – ICT is under-represented in elementary and secondary school curricula, and there is a lack of adequately educated teaching staff
- A large number of start-ups are registering the company's seat abroad
- Lack of initial capital for start-up eco system
- Insufficient investment in R&D in ICT companies
- Inadequate implementation of strategic and legal regulations

## OPPORTUNITIES

- A significant number of developers and software engineers working alone
- Stimulating policy in the field of taxation through incentives for establishing new companies
- Establishing a full service of international electronic payments, which will enable the establishment of competitive e-commerce systems
- Business environment that facilitates connectivity and competing at the global level
- Access to EU funds

## THREATS

- A small market
- Competition at the regional and global level
- Lack of strategic management in companies with regard to ICT – reactive approach
- Outflow of ICT experts
- Lack of IT awareness and literacy

## SECTOR SUPPORT POLICIES

- Providing initial capital for start-up companies and support for accelerator programmes
- Assistance in creating programmes for training managers / marketing specialists trained to sell / advertise ICT products and services
- Introducing ICT professionals, working independently, into legal business flows
- Including adequate statistical indicators for the field of ICT in the official state statistics programme
- Stimulating legislative policy, especially in the field of taxation, and providing incentives for establishing new companies in order to suppress unfair competition between unregistered and registered companies
- State administration must keep pace with the ICT industry and independently implement the solutions, platforms for transparency, efficiency and measurable results
- Providing support to digital transformation projects (financial, educational, etc.)
- Raising awareness of the managements of companies so that investments in ICT are seen as investments, not as a cost
- Support and promotion of a technology transfer centre



- Creation of a registry of IT solutions, with description of functionality and technology of production
- Continually creating e-Services in the direction of G2C, G2B, etc. (e-health, e-participation, etc.) and upgrading the existing systems
- Providing support when informing about and applying for project calls
- Assistance in promotion and entering the global market, as well as in exporting and placing products and services

## EDP ACTORS

### COMPANIES

Crnogorski Telekom, Telenor, Mtel, Telemach, Čikom, S&T, Fleka, MG Soft, Amplitudo, Bild Studio, Logate, Digit Montenegro, Erikson Crna Cora, Telemont, Montex-elektronika, Domen, Digitalna fabrika (Mtel ICT akcelerator), Tehnopolis

### BUSINESS ASSOCIATIONS

Chamber of Economy of Montenegro, Montenegrin Employers Federation, MBA, Association of Managers of Montenegro

### STATE INSTITUTIONS

Ministry of Economy, Ministry of Science, Ministry of Public Administration and the Ministry of Education

### SCIENTIFIC AND EDUCATIONAL INSTITUTIONS

University of Montenegro / Faculty of Electrical Engineering, Faculty of Natural Sciences and Mathematics, Faculty of Economics;  
University of Donja Gorica (UDG)/ Faculty of Information Systems and Technologies (FIST), Faculty of Design and Multimedia;  
University of Mediteran (UM)/ Faculty of Information Technologies (FIT), Faculty of Visual Arts (FVU)

### CIVIL SECTOR

Prona, MANT, ITd, Digitalizuj.me, ISOC.me, Association for Democratic Prosperity – Zid (ADP – Zid)

## INDICATORS

Indicator	2018	2022
Share of ICT in GDP	4.2% (2016) ***	10%
Percentage of ICT professionals in relation to total number of employees in enterprises	3.3 %*	4%
Percentage of ICT graduates in relation to the total number of graduates from all universities	9 %	12 %



Percentage of enterprises using digital marketing in their business	76.4% *	85%
Percentage of enterprises using e-invoices	0.5% *	30%
Percentage of the population with broadband internet access (30 Mb/s or more)	27.5% *, **	65%
Percentage of the population with internet access of 30 Mb/s or more, in relation to the total number of internet users	38.5% (July 2018) **	80%

Source:

\* Monstat

\*\* EKIP (Agency for Electronic Communications and Postal Services)

\*\*\* Strategy for Information Society Development (Monstat data)