MONTENEGRO
MINISTRY FOR
INFORMATION SOCIETY AND
TELECOMMUNICATIONS

STRATEGY FOR THE INFORMATION SOCIETY DEVELOPMENT 2020

PODGORICA, 2016

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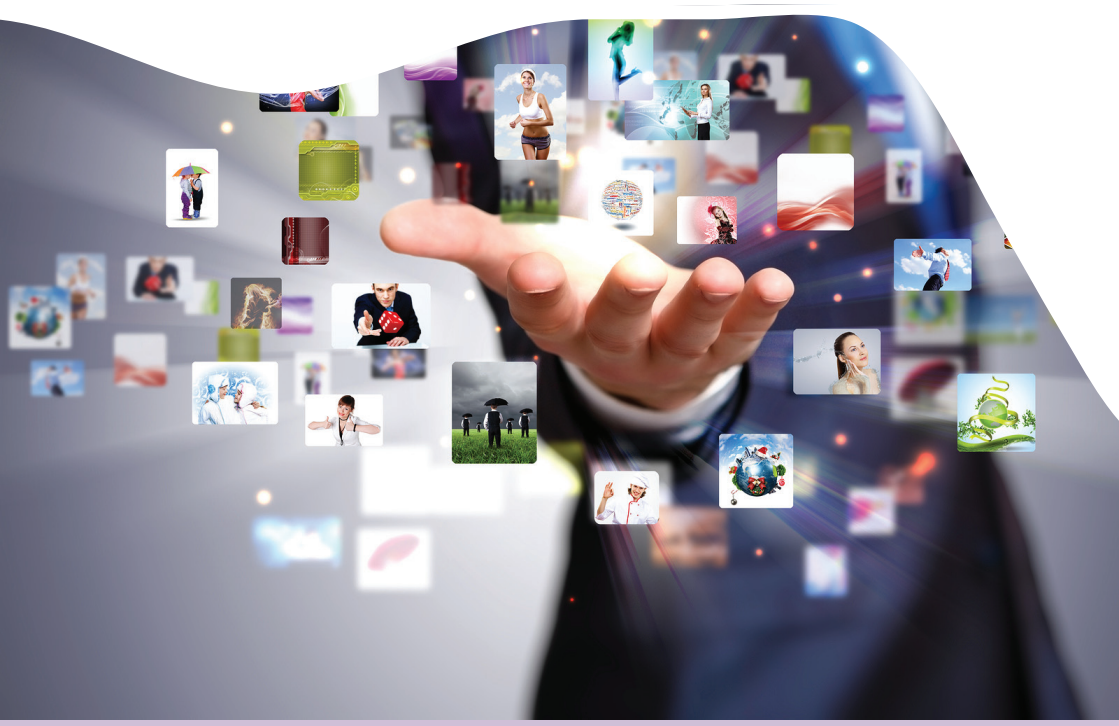

INTRODUCTORY REMARKS

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"Strategy for the Information Society Development of Montenegro 2020" represents a strategy of continuity in relation with the previous one. The life cycle of the previous Strategy ends in 2016. The period from 2012. to present day represents a time of an intensive and dynamic development of information society in Montenegro.

As stated in the last World Economic Forum report on global competitiveness in the field of ICT, Montenegro is a regional leader. This is also the case in the field of the development of the electronic government – Montenegro is ranked 45. in the competition of 194 United Nations member states. The development of an open, competitive, advanced and secure information society was accompanied by the increase in the number of the computer users and the Internet users, and also the progress achieved in the area of the broadband Internet access infrastructure. Significant advances have been made in the field of cyber security. All the main units of the educational institutions, up to the university level, are provided with the Internet connection, the information systems in health and education are established, the scientific and research activities in the field of ICT are enhanced.

Legislation in the field of the information society is largely harmonized with the EU acquis. This is also stated in the European Commission report on Montenegro's progress in 2015, in the field of the European integration, within Chapter 10 that deals with the area of the information society and media. "The European Union supports a well-functioning internal market for electronic communications, electronic commerce, and audio-visual services," the report states, adding that "the rules protect consumers and support the universal availability of the modern services. The progress has been made regarding the issue of the construction of a national broadband network."

„Strategy for the Information Society Development 2020" outlines the strategic development tools in this development field, with a view to reaching the EU standards set out in the Digital Agenda 2020 and the Digital Single Market Strategy. The document is divided into chapters that have been identified as the key steps to achieve the EU standards in this field, namely: broadband infrastructure, cyber security, human capital, digital business, e-education, e-health, e-inclusion, e-government and research, innovation and development. The above-mentioned chapters are tackled through both the European and the national context, the strategic development tools and the indicators that will serve as a kind of benchmarks of the information society development in Montenegro.

DIGITAL MONTENEGRO

2

"Strategy for the Information Society Development of Montenegro 2020" is a digital development strategy which, along with the ICT technologies in the key development areas, also deals with the problem of the lack of the ICT skills, which significantly slows down the multiplicative effects that the modern technologies have on productivity growth. The strategic development tools are targeted to reaping the benefits brought by the modern technologies. The digital technologies enable the development of the commerce, enhance better use of capital and strengthen the national competitiveness. Rapid adoption of the digital technologies in the economy also signified the rapid diffusion of the benefits they have brought. The Internet has become an integral part of the national infrastructure, such as energy and transport, therefore becoming a factor of production in most segments of the modern economy.

In this sense, Internet connection remains an important goal, but also a significant challenge which should contribute to the creation of a digital Montenegro, in combination with the selected strategic development tools. Broadband infrastructure, cyber security, human capital, digital business, e-inclusion, e-education, e-health, e-government, as well as research, innovation and development are the backbone of the information society development of Montenegro. Broadband Internet access at high speed is no longer considered a luxury, but a basic infrastructure for the economic development of a country. Building adequate infrastructure for the fast and secure Internet represents a demand of the digital era, and only those countries that possess the infrastructure which can provide fast data transfer via Internet can count on economic growth.

The target group of users are all citizens and the economy as a whole, which should be provided with available broadband, both in business and in everyday life, regardless of their location, education level, age or interests they have. This implies a greater density of broadband connections, the availability of sufficient speed and affordable price. Particular attention should be paid to the households in rural areas, which need broadband in order to be able to use the services of the information society, towards achieving the balanced development of all Montenegrin regions.

Nowadays, the telecommunication sector is experiencing structural changes and it is still struggling with the unconnected national markets, the lack of regulatory consistency and predictability in the EU, especially regarding the radio spectrum, as well as the lack of the sufficient investment, particularly in rural areas. Those problems have been the focus

of a debate on the package for a single telecommunications market.

In the area of the fixed networks, there is little real competition in the field of the infrastructure, except in very densely populated areas where the cable networks are already set up or in the areas where the local authorities are active. More simple and more proportionate regulation is needed in those areas where there has been a competition in the field of the infrastructure on the regional or the national level. It is necessary to encourage the introduction of high-capacity networks and retain effective competition as well as the corresponding revenue in relation to the risks.

The countries that manage to bridge the digital divide related to the Internet access are often faced with the new digital gap – the problem of the uneven distribution of the skills, which is precisely why the strategic tools of chapters human capital and e-inclusion are focused on eliminating this risk in the course of the digital development of Montenegro.

The administration becomes increasingly digital, and the number of the jobs in the administration which are related to the ICT, i.e. the number of the jobs which require a certain level of the ICT skills, is growing. By 2014, all 193 UN member states had their own national websites, 101 of which enabled citizens to open their personal accounts on the national portal, 73 of them enabled citizens to submit completed tax forms via portal and 60 of them enabled citizens to use portal to register a business. Montenegro, which joined this „company" of countries, will contribute significantly to improving the quality of life of all its citizens, with the further development of the electronic government, modernization of administration and use of the Open Data.

Successful integration of the ICT in education and improvement of the healthcare services through ICT are also recognized as the strategic tools aimed at increasing the social welfare. Strategic tools for research and innovation in the field of ICT are defined with the aim of increasing the level of investment in R&D in this area.

VISION

Digital Montenegro – a country that has recognized the economic and social potential of the ICT, remains the guiding vision of the development of the information society in Montenegro until 2020. As reported by the European Commission, share of the ICT sector in overall EU economy is 2.8%, and this sector, together with the investment in ICT, generates 50% of productivity growth. According to MONSTAT official data, share

of ICT sector contribution to Montenegrin GDP is 4.2%.

In order to exploit the impact of the ICT to the economic growth, this sector is recognized as paramount for the economic development and strengthening of the national competitiveness. In that sense, the vision is focused on inclusive and developed digital society where everyone has an opportunity to create, access and exchange information and knowledge.

MISSION

Legal, organizational and technical framework for the information society development in Montenegro is based on the three components:

- Infrastructure
- Cyber security and
- e-economy, which involves e-business, e-education, e-health, e-inclusion, e-government and research, innovation and development in the field of ICT,

with the aim to provide for the growth of the ICT sector, through the realization of the strategic development priorities, thus ensuring broader use of the ICT in other sectors as well and encouraging the economic growth in general.

STRATEGIC PRIORITIES

Strategy for the Information Society Development in Montenegro 2020 identifies strategic development tools with the key performance indicators.

The key performance indicators (KPI) represent important criteria to measure progress achieved in the scope of the defined development directions. Along with the quality and quantity indicators, there are also the exit performance indicators, that mostly measure the realization of the activities planned, which will be part of the action plans for the Strategy implementation.

Defining the indicators in the adoption phase of the Strategy enables efficient monitoring of the progress achieved in terms of the strategic goals, during their implementation. The indicators can also be used during the evaluation and goals revision processes in the course of the Strategy life cycle.

The specific strategic priorities, defined out of the strategic development tools, will be of particular interest during the Strategy implementation. In this sense, the strategic priorities involve the following goals:

Broadband access availability:

- the basic broadband access ⇒ coverage: 100% of the population by 2018.

- the fast broadband access (30 Mbit/s or more) ⇒ coverage: 100% of the population by 2020.

Strong organizational infrastructure for the prevention and combat against Internet incidents:

- The capacities of the national CIRT for protection, prevention and combat against Internet incidents strengthened, with the total number of the team experts to increase to 20 by 2020.
- The improvement of the structure of local CIRTs.

Growth of the basic and advanced digital skills:

- the percentage of the ICT graduates in total number of the graduates should amount to 10% by 2020. and
- the number of the ECDL certificates issued should reach 15.000 by 2020.

In the field of the digital business, the share of the ICT in GDP should reach 6%, which will be reflected in economic growth and job creation in other sectors of the economy. The share of e-commerce in total commerce should reach 1.5%.

Focus of the e-education segment is the proportion of available computers per student in schools, as well as the skills of the teaching staff, with the following aims:

- Computer-Student proportion should be 1:10 by 2020.
- The percentage of the teachers trained to work on computers should be 30% of the total teaching staff, whilst the percentage of the teachers skilled in the field of cyber security should be 20% of the total number of the teaching staff.

When it comes to e-health, the percentage of e-prescriptions and e-refferals issued, out of the total number of the prescriptions issued, should reach 60%, while online appointments should surpass the traditional appointments, and reach 70% of the total number of appointments.

The elimination of the digital divide between urban and rural areas, as well as income-based digital divide, and the divide based on social and demographic characteristics, represents a priority of the e-inclusion segment of the Strategy.

The orientation towards the further development of e-government in Montenegro should contribute to the increase in number of the users who choose to communicate electronically with the public administration, so the percentage of the citizens who use e-services should be 50%

by 2020, and the percentage of legal entities using e-services should be 30%.

The percentage of the scientific and research institutions in the field of ICT out of the total number of the licensed institutions should reach 30%, which will have positive effects on the increase in financing the research in this field in relation to the overall budget for research and innovation.

BROADBAND INFRASTRUCTURE

3

The society as a whole increasingly relies on the use of electronic communication services as well as the information society services in general. The high quality digital infrastructure is a basis for almost every sector of the modern, innovative society. Digital society, the society that delivers sustainable economic and social benefits, based on the contemporary network services and fast internet connection, is at the top of the strategic priorities of the developed economies.

The introduction of the new ICT and other contemporary services, which require high data transaction speed, is unthinkable without the developed broadband access and adequate infrastructure. The development and construction of modern electronic communication networks, efficient use of the radio-frequency spectrum, geographic and economic accessibility of broadband, represent a goal with respect to the development of digital Montenegro.

EUROPEAN CONTEXT

The expansion of fast and ultra-fast Internet access is one of the priorities set by the Digital Agenda for Europe, together with the of the benefits of Digital Single Market for households and business sector. Digital Agenda has brought concrete measures and goals, as well as recommended deadlines for achievement of these goals.

The main goals for improvement of the broadband access are the following:

- the basic access ⇒ coverage: 100% of the EU population by 2013,
- the fast access (30 Mbit/s or more) ⇒ coveraget: 100% of the EU population by 2020,
- ultra-fast access (100 Mbit/s or more) ⇒ usage: 50% of the EU households by 2020.

EU Member States have adopted national plans and strategies for the broadband access development, which differ among the Member States. The availability of the broadband access via fixed network is highest in the states that possess a well developed xDSL infrastructure amounting to more than 90%. In the recent years the availability of the broadband Internet access via xDSL hasn't significantly changed, due to the fact that the EU states focused on NGA infrastructure (VDSL, DOCSIS 3, FTTP) and wireless technologies development. The availability of NGA infrastructure in EU Member States totals 68%.

The average penetration of broadband subscriptions in EU is 31,1%. The share of different technologies in total number of broadband internet access subscriptions via fixed network is as follows:

- The share of broadband access via xDSL (including VDSL) is 70% (from 100% in Greece to 15% in Bulgaria),
- The share of broadband access via KDS (including DOCSIS 3) is 18% (from 51% in Belgium to 0% in Greece and Italy),
- The share of FTTH/B is 8% (from 58% in Latvia to 0% in Greece and Malta),
- The share of other technologies of broadband access is 4%.

The average availability of LTE technologies in EU Member States is 79% (from 100% in Sweden to 0% in Cyprus). Taking into account all the active users, that is the users who access the Internet both via smartphones and data SIM cards, the penetration of broadband Internet access through mobile networks in EU amounts to 71,6%.

Taking into consideration the needs of the operators of the mobile electronic communication services for additional radio-frequency resources, the majority of the EU countries have performed the allocation of the radio-frequencies from 800 MHz frequency band. Also, the question of freeing up the 694-790MHz (700 MHz) frequency band, with the aim of its faster appraisal for the mobile communication networks, represents the ongoing issue in whole Europe. Several EU countries have already carried out the allocation of the radio-frequencies from 700 MHz frequency band to the operators of the mobile communication networks.

NATIONAL CONTEXT

As reported by the 2011. national census, Montenegro has 620.029 inhabitants and 192.242 households. According to the characteristics of the population, Montenegro is by large a rural country, with the average population density of 44.9 people per km2. The territory is divided into 23 municipalities with 1256 settlements, 40 of which are urban. The majority of the population is concentrated in urban areas, where 64% of the population lives.

The main characteristics of the current level of development of broadband network are as follows:

- The late start of the development of the broadband access market (ADSL: 2005, KDS: 2007, WiMAX: 2008, FTTx: 2011, satellite acces: 2012),

- The lower penetration of the broadband Internet access subscriptions compared to the EU average,
- ADSL technology has the largest share in broadband subscription – 63%, but in the past five years its share is in downfall,
- Higher number of installed and active FTTH/B connections, with their current share in the number of active connections amounting to 9,3%,
- A larger share of broadband connections via KDS, which currently equals 21,2%,
- The share of the rest of the technologies is 6,5%,
- Broadband infrastructure competition exists only in urban areas,
- Good coverage of the population with 3G mobile networks signal and growth of the LTE coverage.

The main features of the current state of development of the broadband infrastructure through the NGA technologies are the following:

- Significant investment in FTTH network in some parts of the urban areas;
- Until recently, the investment in advanced KDS infrastructure (HFC, DOCSIS 3.0) has been mainly focused on some parts of the largest urban areas. However, in recent period it spread to suburban areas;
- The lack of recognition of the importance of fast development of fixed NGA networks and broadband mobile networks by certain local governments, required for adequate planning and issuing of necessary permits for their construction.
- Fixed electronic communication network infrastructure

Operators have developed their own transport networks, used with the aim of connecting different elements within their networks. The transport section of the operators' network (the backbone) is based on SDH, DWDM and MPLS technologies and transport systems, which are realized through fiber optic cables and radio relay links as physical mediums for signal transport. For the realization of the transfer system, mobile operators partly use the fiber optic cables leased from the infrastructure operators.

The access section of the fixed network in Montenegro is still predominantly based on telecommunication cables with copper wires and coaxial cables. The largest operators have implemented IMS (IP Multimedia

Subsystem) platform and have carried out the full migration of their users to this platform.

Fixed connections based on telecommunication cables with copper wires are available in all of the Montenegrin municipalities, in all urban, suburban and in some rural areas. 70% of households in Montenegro have this kind of connection. 93.000 ADSL connections are active. 64.400 ADSL connections are used for Internet access.

Cable distribution system – the KDS, through the implementation of DOCSIS 3.0 standard, along with the distribution of the AVM content, also enables both the Internet access services and telephony. In the past period, the standard KDS with the coaxial cables has been replaced with HFC networks. The KDS connections are available in 13 municipalities, in urban areas where 59% of the population resides. 31.400 connections via KDS networks are active. 19.800 connections via KDS networks are in actual use for Internet access.

The development of access networks based on fiber optic cables (FTTH/B) has intensified in the past years. Fiber optic connections are available to the end-users in 10 municipalities, in urban areas where 54% of the total Montenegrin population resides. 51.000 FTTH connections have been installed, which means that 26% of households in Montenegro have the possibility for access via FTTH connection. 13.700 FTTH connections are active. 10.600 FTTH connections are in actual use for Internet access.

The total number of active fixed broadband connections, independent of the type of the service provided, is 147.800. The penetration of fixed broadband connections compared to the number of households is 77%. 102.400 broadband connections are used for Internet access. The penetration of broadband Internet access (ADSL, FTTH/B, KDS-HFC, WiMAX et al) is 16.5% in relation to the population number, and 53.3% in relation to the number of households. Along with the increased number of users of the fixed broadband Internet access, there have also been changes in the structure of the users, related to the access technologies. The greatest change happened with the share of KDS, ADSL and FTTH connections. In the past five years, the KDS share grew from 4% to 19.3%, the ADSL share fell from 78% to 62.9%, while the FTTH share grew from 1% to 10.3%.

With the development of the fiber optic networks, the preconditions for the access with greater capacities have been created. Therefore, in the operators' offer now we have fiber optic connection packages with

the Internet access speed between 20 Mb/s and 100 Mb/s, but these packages are still not being used to the full extent. The analysis of the fixed connection on the basis of the Internet access speed points to the following:

- 23,6% of the users use packages with Internet speed less than 2Mb/s,
- 62,7% of the users use packages with Internet speed ≥2Mb/s, but less than 10Mb/s,
- 10,1% of the users use packages with Internet speed ≥10Mb/s, but less than 30Mb/s,
- 3,6 % of the users use packages with Internet speed ≥30Mb/s.

Mobile electronic communication network infrastructure

The mobile electronic communication services in Montenegro are provided by the three terrestrial mobile communication networks. All three networks are based on harmonized standards of the second generation (GSM, including its upgrades GPRS and EDGE), the third generation (UMTS, including HSDPA and HSPA+) and the fourth generation (4G, i.e. LTE technologies – Long Term Evolution).

The transport segment of the networks is still largely based on the microwave radio-relay links, and to a lesser extent on the fiber optic transfer. All three mobile operators have carried out the migration of transfer networks towards IP transfer.

The radio access section GSM/DCS1800 is realized within the 900 MHz and 1800 MHz frequency band, while the access section of the UMTS networks is realized within 900 MHz and 2 GHz. The unconditional refarming of the spectrum led to the implementation of the UMTS technology within the 900 MHz frequency band and the LTE technology within the 1800 MHz. The coverage of the population with the GSM signal is around 99%. The coverage of the territory with the GSM signal involves all the inhabited areas, the main roads and the tourist centers, which represents around 90% of the total territory of Montenegro. All urban areas, as well as the significant part of the suburban and rural areas, are covered with the UMTS network signal. The UMTS signal, depending on the operator, covers 90% - 97% of the population. The LTE signal is available in the urban areas, via two operators' networks. The level of the coverage of the population with the LTE network is from 45% to 65%, depending on the operator.

The number of the mobile service users that have accessed the Internet is 326.006, which means that the penetration of the broadband Internet access via mobile network amounts to 52.6% in Montenegro. The users don't consider the Internet access via mobile network as a substitute for the access via fixed network yet, but this will change along with the technological progress and the availability of the LTE technology.

International Internet link

Six operators have established a direct link with international providers of the Internet access abroad. The total capacity of the international Internet link at the end of 2015. was 41 Gb/s. Compared to the last year, the total capacity of the international Internet links have increased by 43%.

Montenegro Internet Exchange Point (MIXP)

The Montenegro Internet Exchange Point is established in 2015. It is expected that the establishment of MXIP would enhance the development of the Internet in Montenegro, lower the prices of the Internet access service, unburden the international Internet links, improve the quality of the Internet access service and the communication safety.

Transfer to the Internet protocol version 6 (IPv6)

The Internet protocol of the new generation, known as IPv6, has been developed in order to overcome the lack of Internet addresses. The benefits of the new protocol, along with the widening of the address space, are: improved efficiency, safety and the possibility of the implementation of modern IoT solutions. This protocol is a prerequisite for the development of future Internet services and a basis for inclusion in the global electronic market.

Having in mind the increase in number of the users of electronic communication services, and the fact that the operators base the electronic communication services almost exclusively on IP platforms, the next logical step in the development of electronic communication networks and services is the implementation of IPv6 protocol. This is precisely why it is necessary to prepare a plan of a migration on protocol IPv6, in accordance with the standards, decisions and suggestions of the European and international authorities in the field.

Radio-frequency spectrum

Through the radio-frequency spectrum use plan in Montenegro for the implementation of the radio access section of public mobile electronic

communication networks, a number of radio frequency bands is allocated, but the number of the requests for additional radio-frequency resources, coming from the operators who provide mobile electronic communication services, is constantly increasing. The necessary radio-frequency resources for the development of the wireless networks are provided through valorization of the free frequency bands, as well as the release of additional frequency bands.

After completion of the switchover from analogue to digital terrestrial broadcasting systems in Montenegro (June 2015), the 800 MHz frequency band became free for the implementation of TRA-ECS system, as is the case with the 2.6 GHz frequency band. It is necessary to finish the allocation of the 800 MHz frequency band as soon as possible, with the increase of the availability of the broadband access as the overriding goal of the allocation of this frequency band for the purpose of the implementation of the LTE mobile networks.

Currently, a number of radio-frequency bands is not appropriately appraised, and they could be used for further increase of the availability of the broadband access.

STRATEGIC DEVELOPMENT TOOLS

For the purposes of this Strategy, the speed of data transfer which is to be considered as the basic broadband access is defined depending on the type of access network as follows:

- The fixed broadband Internet access includes access at a minimum of 2 Mb/s for download
- The mobile broadband access includes access achieved at a minimum through 3G technology, or the UMTS.
- The speed of data transfer that will be considered fast broadband is defined as the broadband speed of 30 Mb/s or more.
- The speed of data transfer that will be considered ultra-fast broadband access is defined as the speed of 100 Mb/s or more.

As one of the main prerequisites for further development of Montenegro, both social and economic, and its transition towards digital society, it is necessary to provide the availability of broadband, through several steps:

- basic broadband access ⇒ coverage: 100% population by 2018,
- fast broadband access (30 Mbit/s or more) ⇒ coverage: 100% population by 2020,

- Ultra-fast broadband access (100 Mbit/s or more) ⇒ usage: 50% households by 2020.

It is necessary to construct electronic communication networks that will enable broadband access at high speed. The transport section of these networks should be implemented through fiber optic cables, to the greatest extent possible. All the available technologies should be used to ensure the broadband access, bearing in mind that no technology alone can provide the accessibility of the broadband services for all the citizens. In order to ensure the broadband coverage at the reasonable financial expenses, it is necessary to implement the optimal combination of the technologies for different geodemographic conditions, and particularly encourage the construction of the NGA networks (FTTx, DOCSIC 3.x) and the development of the mobile networks of the fourth generation (LTE).

In order to make a significant step forward regarding the availability of the broadband Internet at high speed, it is necessary to increase the investment in the NGA networks and expand the NGA networks to suburban and some rural areas. In this context, the development of NGA cable networks based on FTTx and DOCSIS 3.x is of particular significance. Also, by implementing new methods/technologies targeted at the increase in access speed, due to its wide presence in the access infrastructure, copper wires may remain an important medium for the delivery od the broadband services for a long time.

It is necessary to create the conditions for the unhampered construction of the modern electronic communication networks, by way of enhancing investition, adequate planning, simplifying administrative procedures for issuing of the necessary permits and consents for the construction of electronic communication networks. It is also important to secure necessary radio-frequency resources for the development of the electronic communication networks. Also, it is important to create the conditions for the expenses reduction for the construction of the NGA networks, by way of ensuring the common use of the existing electronic communication infrastructure, the availability of the electronic communication infrastructure information (the registry of the lines, the base of the electronic communication infrastructure, the mapping of the broadband availability and the broadband speed) and the public construction works (the single information point on public works), the coordination of the operations and the construction of the facilities for the fast and ultra-fast Internet access.

The principle of the technological neutrality and the creation of possibilities to implement all the available technologies of the Next-generation access networks (NGA), as well as the emerging NGA technologies, is a path that should be followed, whilst using the benefits of both fixed and mobile electronic communication networks.

The construction of the NGA networks, due to the geo-demographic characterics of Montenegro, demands significant investition. This is why the construction of the NGA networks outside of the city centers is not feasible for the operators at the common market conditions. Therefore, the construction of the NGA networks in the suburban and particularly in the rural areas requires special incentive.

However, despite the encouragement of the investment and the incentives in this direction, the fixed cable networks connection will never be implemented in certain rural and distant areas. With this in mind, the further development of the radio-communication infrastructure is extremely important. The development of the wireless access networks (either fixed or mobile) based on the modern, spectrum-efficient technologies, can enable the broadband access relatively fast and with significantly less investment, compared to the construction of the cable/ fiber optics infrastructure. This is particularly important for the rural and sparsely populated areas, with the traditionally low level of the development of the cable/fiber optics infrastructure. Further on, it is necessary to incite the development of the mobile networks of the fourth generation (LTE).

To this end, it is necessary to examine the possibilities of the use of the radio-frequencies from 694-790 MHz, 1452-1492 MHz, 2300-2400 MHz, 3400-3600 MHz and 3600-3800 MHz frequency bands for the IMT systems. Also, taking into account the decisions of the World Radiocommunication Conference (WRC-15) and the CEPT, as well as the determination of Montenegro regarding the harmonization of the radio-frequency use with the European Union countries, it is important to release 700 MHz frequency band freeing it up for the mobile network needs, and take measures to allocate it to the mobile electronic communication services operators.

Also, it is necessary to take all actions, revision of the regulations included, to facilitate the investment in broadband. In this regard, it is necessary: to take particular care to make sure that the construction works include all potential investors in a systematic way; to clarify the issue regarding the right of passage; to construct the maps of the available

passive infrastructure suitable for the cables installation and the upgrade of household installations.

In addition to providing the infrastructure and geographic availability of the broadband access, it is necessary to ensure its economic availability, by way of price regulation for the independent broadband access and the broadband access in the related offers, according to the Law, as well as take measures to increase the Internet use.

Specifically, in the case if the competition in this market proves to be inefficient, the Agency for Electronic Communications and Postal Services, after the implementation of the legally defined procedures, may impose a regulatory measure of price control on the operator with significant power in the relevant market.

STRATEGIC INDICATORS

Indicator	Current state	2018	2020
The availability of the NGA broadband access The percentage of the households in the area of the availability of the NGA (³30 Mbit/s)	26,5%	60%	100%
The penetration of the broadband connections (households) The share of the households which use, at least, the broadband access (³2 Mbit/s)	53,3%	80%	100%
The availability of the broadband connections at high speed The share of the broadband access connections via fixed network at high speed (³30 Mbit/s) in a total number of the fixed broadband connections	3,6%	30%	70%
The penetration of the ultra-fast broadband connections (households) The share of the households that use ultra-fast broadband access (³ 100 Mbit/s)	0%	20%	50%

CYBER SECURITY

4

Nowadays, the Internet, supported with the information and communication technologies, represents a vital national resource of a country and has become one of the main drivers of its socio-economic development. The information and communication infrastructure facilitates daily operations, and citizens are increasingly dependent on the opportunities that it provides in the scope of cyberspace. In such circumstances, its proper protection has become a challenge of national, regional and international importance.

The integration of the ICT in daily activities and operations has become more intense. Accordingly, threats to the information and communication infrastructure, that can endanger its availability, privacy and integrity, can also affect the functioning of a society as a whole.

As countries and organizations are developing and implementing new security mechanisms, a parallel process is taking place - cybercriminals find new techniques to overcome these mechanisms. In order to find an adequate and timely response to modern threats to information security, it is necessary to expand the focus, framework of action and the flexibility to cope with often unexpected high-risk security events.

This strategic program is therefore aimed at identifying and setting the key strategic development courses to raise the overall level of information security, especially at the national level, without neglecting the need for the regional and international cooperation.

EUROPEAN CONTEXT

The European Union Cyber Security Strategy and the European Agenda on Security provide a general strategic framework for the EU initiatives in the field of cyber security and cybercrime. The EU Cyber Security Strategy aims towards open, safe and secure cyberspace.

In addition, trust and security in the ICT are the key pillars of the Digital Single Market Strategy. One of the 16 initiatives identified in the strategy is a public-private partnership that aims to strengthen the EU's cyber security industry and provide the customers with innovative and safe solutions.

The European Cyber Security Strategy, which was adopted in 2013, states that cyberspace must remain open and free and that the same norms, principles and values that the EU supports offline should be applied online. The fundamental rights, democracy and law must be protected in cyberspace. Therefore, cyberspace must be protected from

incident, malicious activities and abuse.

To achieve this, the role of government should be of great importance, as well as the role of private sector which owns a large part of the critical information infrastructure. Therefore, the cooperation between the public and private sectors is crucial.

The EU's vision, outlined in the Cyber Security Strategy, is defined through five strategic priorities:

- Raising cyber resistance;
- Drastic reduction of cybercrime;
- Developing policy on cyber defense and capacity in compliance with Common Security and Defence Policy - CSPD;
- Development of the industrial and technological resources for cyber security;
- Establishment of a coherent international policy of the European Union cyberspace and promotion of the fundamental values of the EU.

In order to accomplish this, it is necessary to have a) a completed legislation and specified criminal norms, b) the established and functional national teams for prevention and response to cyber incidents with the adequate technical, financial and human resources, c) the qualified private sector to invest the necessary financial resources, d) complementarity of the EU and NATO standards and procedures.

Considering the crossborder nature of cyber attacks, the aspect of the international cooperation in the field of cyber security is also emphasized. The establishment of coordinated mechanisms of prevention, detection, mitigation and response, enables the exchange of information and mutual assistance between the national authorities.

In addition to the abovementioned activities, the emphasis is also placed on raising level of awareness among the end-users and the whole society, as well as the protection of children on the Internet.

NATIONAL CONTEXT

In the previous period, through the legislation and policy documents, Montenegro followed the main standards, guidelines and recommendations of the EU and NATO in the field of building cyber security and adequate protection of the critical infrastructure.

Montenegro's strategic goal is to build an integrated, functional and efficient cyber space, in accordance

with the international standards and principles. The strategic directions in this area are outlined in the Cyber Security Strategy 2013-2017.

In accordance with the task to facilitate early detection of cyber threats and incidents and adequately react and respond to them, the Main office for the computer and security incidents protection on the Internet (CIRT) is established as an organizational unit within the Ministry for Information Society and Telecommunications. CIRT is a central body for coordination of prevention and protection against the computer security incidents on the Internet and other information systems security risks for Montenegro.

CIRT, in line with its responsibilities, acts:

- Preventive - providing useful information and advice on Internet safety.
- Reactive – analyzing and performing detailed investigations in the case of Internet incidents at the national level.

In accordance with the recommendations of the EU, national CIRT has the function of the national contact address in the field of cyber security, and also acts as a coordinating body at the national level.

In addition, Montenegrin national CIRT conducts activities aimed at establishing and enhancing partnerships both at the national and at the international level, for the purpose of better and more efficient fight against cybercrime and cyber threats. The computer systems and users in Montenegro are exposed to the most of the cyber threats and attacks that affect the rest of the world.

In 2015, there was an increase in the number of applications to 132, which was tripled compared to 2014. The attacks on the information infrastructure were registered, as well as the attacks on the Internet provider services, taking control of several websites of the Montenegrin institutions, as well as the banking sector. Also, it was noted that the attackers took control of the user profiles of the Montenegrin citizens on social networks and wrote inappropriate content on behalf of those users.

National CIRT currently employs 4 people. In accordance with the Cyber Security Strategy of Montenegro 2013-2017, 29 local CIRTs were formed.

STRATEGIC DEVELOPMENT TOOLS

After its formation, the National Council on Cyber Security will have the authority to discuss relevant issues concerning cyber security. The coordination in this sense will contribute

to the improvement of cyber security measures, through active cooperation and proposing activities to CIRT in the establishment of the system of protection of computer and security incidents on the Internet, as well as assisting in identifying the timely response to possible threats to the information infrastructure.

Due to the constant growth in the number of services that the state authorities and the private sector provide over the Internet, both to the citizens and legal entities, it is necessary to define the critical information infrastructure in Montenegro and develop the protection procedures. The critical information infrastructure (CII) is the kind of the infrastructure that its compromising would, among other things, result in the loss of life, tremendous financial damage (expressed as a certain percentage of GDP), or have a very negative effect on the environment. In many developed countries, regulatory role in protecting the critical information infrastructure, because of its exceptional importance, is performed by a separate organization as its only function. In Montenegro, the national CIRT is determined to perform this function, and in order to perform it effectively CIRT will need to have adequate human resources at its disposal.

The authority of CIRT, as the supreme organization in the field of cyber security at the national level, as well as a range of services and capabilities it should possess, in accomplishing foreign policy goals of Montenegro - membership in the EU and NATO, will continually increase. Among other things, it will include the protection and determination of the critical infrastructure, as well as other activities related to it, operations on 24/7 basis, activities for reducing the number of incidents, the training of civil servants and citizens. As recommended by the international partners, CIRT team must have a minimum of 20 officers.

It is necessary to strengthen the capacities to modernize the Group for High Technology Crime, consisting of the representatives of the Ministry for Information Society and Telecommunications, the Police Administration, the National Security Agency. The improvement of the technical and human capacities of the Forensic Center is also a task for the future period.

Given that a large part of the critical information technology infrastructure belongs to the private sector, it is necessary to strengthen public-private partnerships in this field especially in terms of defining the procedure of information exchange. Cooperation will be improved through the formation of local CIRTs with the legal entities or individuals who

access or handle the data. These teams will deal with the protection from the computer and security incidents on the Internet and other security risks of these systems. These teams will work with CIRT in the application of cyber security measures.

Currently, the cyber security program is studied through thirteen subjects at three universities in Montenegro as part of bachelor, specialist and master studies. In cooperation with the Ministry of Education and Universities in Montenegro, the importance of this topic should be highlighted and it should be studied through more subjects in the field of cyber security, for the purpose of providing workforce with highly specialized knowledge in this field. This is also necessary due to the fact that cyber security is increasingly becoming a part of the general security of a country.

In order to ensure a safer Internet environment for the Montenegrin citizens, it is necessary to work on education about the importance of cyber security, with a focus on children protection on the Internet, because of the fact that the statistics show that over 95% of children under the age of 15 use computers and the Internet, and over 60% use the Internet every day or almost every day. Considering the fact that one child out of five has a negative experience when using the Internet, and that currently about 12% of the students from the sixth to the ninth grade of the elementary schools are educated on safe use of the Internet, we must work on increasing the number of children educated about the safe Internet use. Also, given the fact that in the secondary schools there is no subject that deals with cyber security, it is necessary to take measures to introduce at least one subject that will encompass this area.

In addition, it is necessary to work on improving the hotlines for reporting illegal content, as well as to work on establishing a Safe Internet Center, in cooperation with CIRT nad international networks INSAFE and INHOPE. The abovementioned includes the hotline for reporting illegal Internet content, center for the promotion activites and the Internet safety awareness-raising center, as well as support hotlines.

The aim of this project is the centralization of the activites in the field of Internet safety, with particular focus on children safety. In this sense, the existing infrastructure functioning within CIRT will be upgraded, through the hotline for reporting the illegal Internet content. The most important segment of this project is the establishment of the web portal that will encompass all the functions mentioned above. Long-term plan is for the Safe Internet Center

to bring together a significant number of partners, particularly the NGOs, which will further ensure its sustainability.

Also, it is necessary to strengthen the national capacities for an adequate response to cyber threats and attacks by way of organizing one-year simulation of large-scale attacks.

STRATEGIC INDICATORS

INDICATOR	Current state	2018.	2020
Strengthening administrative capacities of CIRT	4	10	20
Local CIRTs in state bodies and local governments	29	45	60
Local CIRTs with legal entities	0	20	40
Educating children on safe Internet use	12% of students from the sixth to the ninth grade of the primary school educated	25% of students from the sixth to the ninth grade of the primary school educated	40% of students from the sixth to the ninth grade of the primary school educated

HUMAN CAPITAL

5

Information and communication technologies are advancing at a tremendous speed and introducing technological changes that create conditions for a future in which routine work tasks will be done by machines. Experts in the areas of human capital and markets seriously count on these predictions.

This fact implies a necessity for a variety of skills which will follow the automation process in the future, taking the place of those skills that will become superfluous. Until now, educational systems were quite slow in responding to these changes. Since the changes are quite rapid, the required skills also change rapidly. According to the World Bank and their development report for 2016, this means that the workforce will have to complement their skills more and more often throughout their career. This dynamic is already present in many advanced and transition countries, but it is also significant for the developing countries, which must be prepared for new circumstances.

EUROPEAN CONTEXT

According to the DESI[1] indicator, "Human capital" dimension includes two sub-dimensions: the basic skills and use, as well as the advanced skills and development. The "basic skills and use" dimension encompasses indicators of the Internet use by the individuals, as well as their digital skills. The "advanced skills and development" dimension includes indicators of the employment of the ICT professionals and graduates in science, technology and mathematics.

Concerning the Internet use, according to the European Commission, 75% of the EU population uses the Internet at least once a week, while the majority of the citizens (65%) use the Internet on a daily basis. The number of the Internet users is increasing. The objectives of the Digital Agenda on the Internet use are therefore achieved ahead of the schedule, i.e. in 2015. If this trend continues, we can expect that by 2024. 90% of the EU population will become regular Internet users.

However, differences between the European countries in this sense remain significant - the highest rate of the Internet use on a weekly basis is

[1] DESI-digital economy and society indeks is a composite index that represents the sum of the relevant indicators of the digital progress in Europe, which evaluates the evolution of the EU Member States in the field of the digital competitiveness

in Luxembourg, the Nordic countries, the Netherlands and the United Kingdom, where this percentage is around 90% and more. On the other hand, the countries with the lowest rate of the Internet use during the week (Romania, Bulgaria) are facing the fact that about half of their population does not use the Internet during the week. The percentage of the citizens who do not use the Internet at the EU level is around 18%. The greatest progress in reducing this number was recorded in Estonia, Bulgaria, Poland, Cyprus and Lithuania.

The greatest obstacles to the Internet access are the lack of need, the insufficient level of the digital skills and costs. In the recent years, a lack of digital skills has been noted as a factor that affects the Internet use to a large extent. In 2014, 40% of the EU population did not have a sufficient level of the digital skills, while 22% of the population did not have the digital skills at all. The last figure varies - from 5% in Luxembourg to 45% in Bulgaria and 46% and Romania. In eight countries (Portugal, Poland, Croatia, Cyprus, Italy, Spain, Bulgaria, Romania) about 30% and more of the population does not have the digital skills at all. In Italy, even 18 million people do not have digital skills.

In 2014, 32% of the EU workforce did not have a sufficient level of the digital skills, while 13% did not have the digital skills at all. While in some countries, such as Poland, Italy, Cyprus, the rates of the workforce having digital skills are around 20% and more, in Romania and Bulgaria more than a third of the workforce does not have the digital skills. If this percentage is added to the percent of the workforce who has only a low level of digital skills, we come to an average of 32% of the workforce that can be considered insufficiently digitally literate, at the EU level. In Bulgaria and Romania, this percentage is 61% and 77%, accounting for the majority of the workforce.

As for the employment of the ICT experts, this percentage is increased by 4% over the last decade in the EU. The largest increase occurred in Germany, the United Kingdom, France. However, it was significant in smaller countries also.

Despite this, the EU is faced with the problem of the growing deficit of the ICT experts, which is projected to be as high as 825,000 vacant jobs by 2020. Currently the largest gap between supply and demand of the ICT experts in the labor market was noted in Germany. However, it is anticipated that this gap will be growing in the United Kingdom and in Italy, largely due to the inadequate number of the ICT graduates.

NATIONAL CONTEXT

According to the Monstat survey from October 2015, the percentage of the persons who have used a computer in the last three months is 67.2%, while the percentage of those who have never used a computer is 26.1%. Regarding the Internet use, 68.1% of the people said they have used the Internet in the last three months, 79.9% of which used the Internet every day or almost every day, and 17.1% used the Internet at least once a week.

Among the citizens who have used the Internet in this period, 90.6% of persons aged 16-24 use the Internet every day or almost every day. Among the reasons for not using the Internet, most of the people interviewed said that they did not need to use the Internet (45%), while for the 27% the lack of the skills was the reason for not using the Internet, for the 24.7% it was the cost of the Internet and for the 27.3% the cost of the equipment was the main reason.

Regarding the basic and advanced digital skills, by the end of March 2016 a total of 8,290 citizens of Montenegro has begun certification of their computer knowledge and skills according to the ECDL standard, while 7,721 citizens gained the ECDL certificate. Through the project "Implementing ECDL standards in the education system", which was completed in June 2014, the authorized ECDL test centers in the Examination Center of Montenegro and the Human Resources Administration of Montenegro were established to assume the role of centers for the ECDL training and certification in the educational system and in the state administration of Montenegro.

According to the survey on the use of ICT in enterprises conducted by Monstat in 2015, 38.5% of the companies (out of a total number of companies that use computers in their business) reported to employ ICT/IT experts who have the ability to develop, maintain and manage ICT or IT systems and applications, which represents an increase by 0.8% compared to 2014.

According to the objectives of the Information Society Development Strategy 2012-2016, the number of the ICT graduates was to increase to 25% of the total number of the graduates by 2014, and to 30% by 2016. This task has not been accomplished since during the 2011-2015 period there were 14,490 graduated students at the Montenegrin universities, 1,208 of which graduated from the study programs related to the ICT, which amounts to 8.3% on average for this period.

The abovementioned facts confirm that, as is the case in the EU, a huge deficit of the ICT skills, both the basic and the advanced, is evident in Montenegro. What is also emerging as a conclusion is that the existing education system and programs (formal and informal) will not mitigate this deficit in the coming years.

STRATEGIC DEVELOPMENT TOOLS

The technological revolution turned the concept of non-formal education and lifelong learning into an urgent human need. The result of the dynamic development of the technology is that the knowledge becomes obsolete very fast. Moreover, as a result of the rapid changes in the technology, labor mobility and market demands of each individual's career will be transformed up to five times during their lifetime. In this context, we come to the conclusion that the professional development is required because of the retention of the existing positions as well as due to the increase in the competitive position of the individuals in the labor market. Thus, the traditional concept of a career is becoming history in the digital age. According to a research, the competencies that a worker acquires during the seven year period of work get outdated and are of no use in the business operations anymore, so the worker has to acquire completely new competencies after that time.

Starting with abovementioned circumstances, one of the strategic tools of the development must be encouraging the greater use of the Internet by all structures of society, as well as the acquisition of digital competences. The second main action must be focused on creating a greater number of the ICT experts. Also, the efforts should be focused on eliminating the digital gap between generations, while bearing in mind that a significant percent of the workforce in Montenegro use the modern technology insufficiently. The emphasis should be on encouraging women towards the education and career in the ICT, because women comprise less than 30% of the workforce in the ICT, and only 19% of them are ICT managers, according to the European Commission surveys. When it comes to local circumstances, the finds from the MONSTAT survey on the use of information-communication technologies in Montenegro point to the fact that 30.7% of women have never used the computer, which is one of the reasons to organize a targeted campaign on raising awareness of women on the importance of the digital competencies.

Strengthening human resources for the development and application of the ICT is a challenge for all segments of the society, particularly for the educational system, which must generate the knowledge and the skills that can, as a direct invest-

ment into enhancing the country's competitiveness and higher economic growth in the digital economy, support the creation of digital Montenegro.

Global IT labor market has shown stability in the times of the crisis, as evidenced by the fact that the ICT personnel is in deficit, confirmed by the fact that the ICT jobs are the most wanted at the global level.

In order to monitor level of the digital literacy adequately, it is necessary to develop the indicators of the digital literacy in the country, in line with the EU standards.

STRATEGIC INDICATORS

Indicator	Current state	2018	2020
The percentage of the ICT experts in relation to the total number of employees in enterprises	n/a	2 %	4 %
The percentage of the ICT graduates in a total number of the graduates at all univeristies	8,3 %	9 %	10 %
The number of the ECDL certificates issued	7.721	10.000	15.000

[1] http://work.chron.com/top-ten-professional-careers-13333.html, http://www.businessinsider.com/best-jobs-of-the-future-2014-1?op=1

DIGITAL BUSINESS

6

Internet and information and communication technologies incite the inclusion of the companies in the global economy through the expansion of trade , increased productivity of capital, intensifying competition in the market, which in turn boosts innovation, making the ICT and business mutually inseparable in the modern economy. Their interconnectedness bears immediate benefits for households too, not only business and technology per se. On the other hand, creation of new jobs, better exploitation of human resources, the production of consumer surplus, represent immediate benefits provided to the citizens by the digital economy itself.

The share of the ICT sector in GDP is around 6% in the OECD countries, whereas in the developing world this share is significantly lower. As estimated by the World Bank, the greatest contribution of the digital technologies to the economic growth occurs in those cases when traditional sectors of the economy exploit ICT to modernize their activity.

EUROPEAN CONTEXT

Recent studies estimate that the digitalization of products and services can bring more than 110 billion in annual revenues to the European economy over the next five years.

In April 2016, the European Commission launched the first initiative of the Digital Single Market package related to the industry. The aim of this initiative is to prepare Europe for the upcoming challenges of the digital products and services. This will require coordinated investment from both the private and the public sector.

In that sense, the following areas are of particular importance:

- "Startup Europe" aims to strengthen the business environment for web and ICT entrepreneurs so their ideas and businesses can develop without restraints
- The Future of the Internet - a stronger, more connected Internet, which corresponds to the needs of citizens both at work and at home
- Data – referring to the need to exploit the benefits of the access to the important data, in order to create solutions designed for the health care system and the challenges in the field of transport
- Cloud computing - better standards, more secure contracts and greater use of cloud in private and public sector are the issues that need to be worked on in the future

- Digitalization of the European industry in the direction of maximizing the benefits of digital technology in every industrial sector in Europe

- Regular meetings with web entrepreneurs and expert groups in order to discuss new ways to promote a more inclusive digital society.

Standardization represents a very specific problem, and the European Commission suggests particular set of measures regarding this issue:

- Five priority areas of focus: 5G, cloud computing, Internet of Things, data technologies and cyber security.

- Co-financing the tests and experiments in order to accelerate the setting of the standards, which further contributes to innovation and business growth.

NATIONAL CONTEXT

Digitalization of the business and the online business concept represent enormous economic potential for the development of small and medium enterprises.

Research on the factors that create obstacles to the introduction of the ICT in Montenegro has not been conducted so far, but judging by the other available studies, the price of introducing the ICT in business appears to be important factor influencing this decision.

Despite the fact that products and services from the ICT sector increased its share in the GDP up to 16.5 % in many countries in recent years, and more than a third of the economic growth occurred due to the activities that were developed on the basis of the ICT technologies, there is no significant entrepreneurial nor company activities that rely on online business in Montenegro.

According to the available data, there is a small number of companies registered for conducting online business in Montenegro. Collecting data on companies engaged in the information society services is complicated due to the fact that the information society services and electronic commerce are not specifically classified in the process of business registration.

As stated in the last Monstat (Statistical Office of Montenegro) report, despite the significant growth of 9.6% in 2014, we can say that a small number of companies use online business concepts. There are numerous reasons for such state of affairs: many companies are inert in this sense, and being satisfied with the common channels of sale and service delivery they do not want to change the sales platform; the com-

panies are insensible to the new technologies, and so on.

According to a survey conducted by Monstat in 2015, the percentage of the enterprises that have received orders via Internet is 24.3%, while the percentage of the companies that have placed orders via Internet is 24.1%. When it comes to the exchange of electronic information in procurement management, 31.3% of the companies regularly exchange information in procurement management with their suppliers or customers.

Analysis of the products and services that the Montenegrin IT sector offers at the market shows that the majority of the companies base their portfolio on hardware. The software development and IT services are at the second place. The fact that companies that mainly deal with hardware employ almost twice as many people as those engaged in services or software is particularly interesting.

According to the "IT Industry Barometer" for Southeast Europe for 2016. (SEE ITIB 2016), total of 219 companies are active on Montenegrin market (although there is a number of 560 companies officially registered) and majority of them bases their portfolio on hardware. The software development and services are at the second place. Software products and hardware services are at the third place, and this is a trend in past three years.

Montenegrin IT sector is largely locally owned (84%), while there is 14% of foreign companies and 2% of the local representatives of the foreign companies. About 70% of domestic companies work with the international companies at the local market, and only 22% are in the export business.

According to the survey, in 2016, the smallest percent of the companies is involved in procuring the services for the hardware products (38%), while the largest percent of the companies deals with hardware products as such (72%). There is an evident growth comparing to 2014. 88% companies are not members of the ICT associations, while 8% companies are members of the Montenegrin IT cluster. 65.2% have cooperated with the international clients, which is 8.8% decline comparing to 2015.

Although import has grown for 8.1% comparing to 2015, only 26.1% of these companies export their services, which is the smallest percent among the countries involved in the survey. Besides, the survey has found that the majority of the companies in Montenegro are oriented towards the region, when it comes to developing the export potential.

Montenegrin companies recognize the lack of support by the government institutions, lack of suitable brending of the domestic IT industry abroad, lack of information about the foreign markets, lack of adequate business contacts abroad, as well as lack of training and consulting services, as the main export obstacles.

Montenegro has the lowest average number of the employees in the ICT companies, on a regional level – 46% of the companies have up to 5 employees. Also, the survey found that the ICT companies in all of the countries, except for Montenegro, plan to raise the number of the employees.

However, greater use of the ICT by SMEs, which is at a relatively low level at present, directly contributes to the digital business in general.

Small number of innovative start-up and spin-off companies, which intensive participation at the market should be provided through the necessary administrative and market conditions, represents another weak point regarding Montenegrin IT market.

STRATEGIC DEVELOPMENT TOOLS

Although the number of the companies that use the Internet is continuously growing, low percentage of companies that trade or operate online represents a limiting factor in the development of not only business itself but also the digital economy of the country as a whole. Delay in use of new business models in the sector of small and medium-sized enterprises affects equally the competitiveness of the Montenegrin economy and the growth of the companies. In this context, strategic development tools point to encouragement of transformation of the traditional to digital business models through e-commerce, e-banking, the use of e-invoices and e-public procurement.

Towards building a digital economy, it is necessary to raise awareness on the importance of the ICT for business profitability through targeted campaigns in cooperation with all stakeholders. From the standpoint of the digitalization of a business, it is particularly important to create conditions for electronic business concept, which is why the focus should be on creating conditions for the use of e-segments of business. It is particularly important to create a legislative framework for equal treatment of e-invoices and paper invoices, even more so because, in comparison with the paper invoices, e-invoice processing is easier, it is faster in reaching the user and it is easier to store.

Hierarchical organization of the companies that prevailed in the 20th century is already past and it cannot function in the framework of

the global, ever growing digital economy. Montenegrin companies must base their business models on the users' excpectations, product improvement, cooperation in innovation and organizational leadership, which more and more involves data experts in decision-making process and organizational learning. These are only some of the activites towards digitalization of the Montenegrin economy, which needs to be oriented towards maximizing the benefits of the digital technologies.

Creating the conditions for the development and optimizing the use of cloud computing, by businesses and public sector equally, can also contribute to the growth of the digital economy. This constatation derives from the statistic data available, which confirm the multiple benefits of cloud computing. In 2011, Microsoft conducted a survey, which found that transfer to cloud services has made a contribution of 40% rise in income for small and medium enterprises, comparing to those that haven't transferred to cloud. In 2012, the EU study found that, for over 80% of the surveyed companies, transfer to cloud computing means decrease in expenses up to 20%. Also, the study found that productivity rises up to 40%.

Since changes in the education system can deliver results in approximately 10 year time and not before, the activities should be focused on "import" of the ICT experts and workforce. There are examples of some developed countries which create the conditions for young educated people to recognize their chance of success in working within an environment that has its own advantages, and this is something we can create in Montenegro. Production of organic (green) software should be in focus, because it requires a relatively small investment and produces enormous economic growth and thus has had its "explosion" in the market. The creation of the necessary environment includes: adopting simple procedures to open ICT companies like these, with certain benefits and incentives in the domain of tax legislation regarding these companies, the provision of sufficient infrastructure resources (communication and power) and provision of premises with the necessary facilities. These measures are aimed at the development of the ICT market and encouragement of the economic development of Montenegro in general.

Stimulating environment for the start-up companies, along with enhancing the development of electronic public procurement, would create a much favorable business environment. The start-up companies enhance innovation, as they are the present and the future of the digital economy. Their development

has retroactive effect both on the economy as a whole and on the labor market, particularly on youth employment.

E-procurement, as well as comprehensive e-infrastructure for G2B and B2B services, in addition to simple procedures, offers significant time savings in public procurement procedures, and, through the reduction of discretionary rights, directly contributes to reducing corruption, which is why it is identified as one of the strategic development tools.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
The percentage of the companies that use ERP systems for the internal communication	43,8 %	51%	60 %
The percentage of the companies that use RFID technologies	n/a	3 %	6 %
The percentage of the companies that use social networks in business	43,2 %	51%	60%
The percentage of the companies that use e-invoices	n/a	0,5%	1,5 %
The percentage of SMEs that sell products or services online	24,1 %	30 %	40 %
The share of e-commerce in total commerce (on the national level)	n/a	0,5 %	1,5 %
The share of the ICT-a in GDP	4,2 %	5 %	6%

E-EDUCATION

7

Modern labor markets are largely fluid by nature, and require creativity, teamwork, problem solving, critical thinking, in an ever-changing environment - these are the skills that the traditional education systems do not offer, and they are, on the other hand, very difficult to measure.

As more and more aspects of the modern economy become enormously reliant on the Internet and technology, the demand for advanced ICT skills is also rising. Although, compared to total numbers, proportionally small fraction of the labor force of the future will be directly involved in, for example, software development or system design, it is still important to introduce children in classrooms with programming and basic concepts of ICT, because it can and should influence their future career choice.

Nowadays, we can witness how digital technologies can help both teachers and students – enabling teamwork in classrooms via Internet, through applications that stimulate creativity and problem solving, all the way to the educational video games. The development of skills starts at the very birth and lasts throughout the whole life, and therefore technologies must find their place in the system of education.

EUROPEAN CONTEXT

The Digital Agenda for Europe calls for the introduction of e-education in the national policies and programs, in order to modernize education and training, including the curriculum, the evaluation of knowledge acquired, as well as the professional development of the teachers and educators.

The European Commission estimates that e-education is not sufficiently represented in education and educational policies of the Member States. Although education and learning represent segments of the national policies that are the responsibility of the Member States, the European Union is authorized to support the States in their efforts to modernize education and training systems, particularly through the promotion of exchange of good practice, as well as through the support for research and studies that deal with the efficient use of the ICT in teaching.

There are many benefits of e-education: acquiring new skills, adopting new teaching methods, the individualization of learning and teaching according to the needs of the students and teachers, the diversity and richness of teaching and learning styles, the innovative teaching practices that encourage cooperation, effective training of the workforce, but also

the lowering of the training price and time saving .

The new risk of the digital age is in focus - the emergence of the digital divide between those students who have access to the innovative education based on the use of the advanced technologies and those students who are, in this sense, digitally marginalized.

According to the European Commission's position in this matter, open technologies, which provide access to the education for everyone, represent the solution to the problem. Owing to the technologies, students can build-up their knowledge out of the open and free resources, create the educational communities both within the school and classrooms and outside of them, learning becomes personalized activity, customized for the individual student, teachers create a community where they can share experience and teaching materials, access to a wider range of the educational resources is provided.

Problem of greater inclusion of the ICT in education concerns mainly the fact that the European Union, due to the lack of the ICT professionals, can expect the number of up to 825.000 vacant jobs by 2020.

A total of 9 EU countries have integrated or will integrate the programming at the elementary school level in the curriculum. At this level, programming is part of the curriculum in Estonia, France, Spain, Slovakia, United Kingdom, and will become part of the curriculum in Belgium, Finland, Poland and Portugal.

A total of 12 EU countries have already integrated or will integrate the programming at the upper secondary education level - Austria, Bulgaria, Denmark, Estonia, France, Hungary, Lithuania, Malta, Poland, Slovakia, Spain and the United Kingdom.

NATIONAL CONTEXT

All of the main units of the educational institutions, up to the university level, have access to the Internet connection (ADSL - 4Mbps or satellite internet - 8Mbps). The regional units of the educational institutions are not covered by the Internet connection. In all educational institutions up to the university level the minimum amount of the computer equipment is provided. The computer - student proportion in primary schools is 1:16, and 1:14 in the secondary schools.

When it comes to the basic level of the IT skills, a series of the trainings for the teaching staff have been conducted, in order to provide them with the basic knowledge in this field. Through the project "ECDL for digital Montenegro" around 20% of

the teachers and the administrative staff in the educational institutions have been trained. In addition, 150 teachers attended training on the IT security (1.5 %). The level of the development of the digital materials for teaching and learning is insufficient (didactic software, e-books, e-learning, etc.).

There is an evident deficiency of the primary and secondary education, which, either due to the late introduction of the information technology subjects, or the content of the subjects per se, pays little attention to the importance of the digital competences in the information society, despite the fact that 90% of job positions require workforce with acquired digital skills. This situation is further complicated by the fact that the educational system lacks educated staff for teaching IT-related courses.

Number of the graduates in ICT-related study programs is at the low level.

STRATEGIC DEVELOPMENT TOOLS

Starting from the national context and conditions in e-education, it is necessary to work intensively on the Internet signal coverage of the regional units of the primary schools, as well as to increase the Internet speed in the main units of the educational institutions which are covered with the Internet. Providing educational institutions with the computer equipment must be a continuous process in order to provide enough equipment for the teaching performance and improve the computer-student proportion.

In addition to training teachers to use the information technology at a basic level, it is of particular importance to train them to apply the ICT in the teaching process itself, so the students can benefit more from the Internet and the technologies as such. Consequently, it is necessary to further promote the web portal for teachers. It is also necessary to provide didactic software that will enable better and more effective application of the ICT in the teaching process. However, the e-education process must take into account students as well, so it is necessary to establish a suitable portal for students, which would accompany the curriculum, enable some kind of knowledge evaluation and offer extra curricular activites aimed at general education such as culture, sport, music, film and such.

It is important to establish a system of distance learning and upgrade the curriculum with the aim of introducing larger number of the IT subjects, due to the current state of late introduction of the information technology in the primary education and substantial lack of a mid-level education, which can, with a change in the concept, create useful experts

at the level of the technicians and contribute to eliminating the bottleneck between the education system and the labor market needs. It is necessary to evaluate the distribution of the IT subjects in the primary and secondary schools, as well as the profile of the teaching staff that conducts the IT courses, and, on the basis of these results, to take the appropriate measures to improve the teaching process of the IT subjects and to improve the application of the optional IT subjects in the educational institutions at all levels of education.

This is all the more important because the skills acquired by the young are not necessarily helpful in maximizing the benefits.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
Student - computer proportion	1:16 (elementary schools) 1:14 (secondary schools)	1:12	1:10
Internet coverage in regional school units	0%	50%	100%
Internet speed in main units	4 mbps fixed 8 mbps satellite	8 mbps fixed	20 mbps fixed
Percentage of teachers trained (basic IT skills)	20%	25%	30%
Percentage of teachers trained in IT security	1,50%	10%	20%
Percentage of use of teachers' web portal	1%	10%	20%

E-HEALTH

8

One of the basic tools which, together with organizational changes and the development of new medical skills, can significantly contribute to the development and advancement of the healthcare system, improving the availability and quality of the healthcare services, as well as their higher efficiency and productivity, is a set of systems and services which is known as e-health. E-health encompasses a broad scope of application of information and communication technologies in the healthcare system and it is designed for all the system participants: the citizen (for receiving the right information in a customized form), the patient (e-prescription, e-referral, e-identification), healthcare workers (integrated approach to electronic patient records concerning the time and level of healthcare), and system administrators at various levels (providing organizational and operational information), as well as the healthcare system as a whole (the exchange of the information among the various entities of the healthcare system).

EUROPEAN CONTEXT

Starting with the presupposition that technology development for e-health can enhance health care quality and reduce health service expanses, the European Commission has adopted a whole set of documents (action plans, recommendations, directives) for the purpose of furthering standardization and interoperability as well as certification of electronic health records and equipment. Also, a Directive aimed at establishing rules for simplifying the approach to secure and quality crossborder healthcare in the EU and ensuring patient mobility, as well as improving cooperation in the field of health care between the Member States, while recognizing the responsibility of respective Member States for determining health-related social insurance eligibility.

Traditionally, the standard of investment for the EU is that 2-4% of the total health budged is allotted for digitalization of health care. The changes to health systems, the volume of work and other factors affecting their performance, make health care information system and information and communication technologies application a priority for the development of total health care systems and strategic planning in health in general.

NATIONAL CONTEXT

The process of planned informatization of the health system began in 2000 with the development of informatic support to operational processes of the Health Insurance Fund. In this phase, basic common resources (technical-technological) which lay the foundation for all further infor-

matization of the health care system, in accordance with the project of health care system improvement and all related reform processes.

The informatization of the different levels of the health care system started in 2004 with the informational support of reforms of primary health care, and continued with the informational support of secondary health care, statistical reporting, production and distribution control of drugs in Montenegro. The informatization of primary health care was focused on supporting implementation of new methods of financing the work in the beginning, later moving on to support of medical processes themselves.

The informational health care system was implemented in the following institutions:

- at the primary level (all community health centers, private dental offices under contract with the Fund, Emergency Department),
- at the secondary level (all general hospitals), blood transfusion medical services (Blood Transfusion Institute of Montenegro), health insurance services (Health Insurance Fund),
- health-statistics reporting system (public health) and microbiological diagnostics (Public Health Institute)
- Pharmaceutics (ZU Pharmacies of Montenegro "Montefarm"), control of drug production and distribution in Montenegro (Drug and Medical Resources Agency).

All users of the health insurence system in Montenegro have an electronic health record (EZK) in the form of a centralized electronic document available to the health care employees, and the institutions connected to the integral health care information system (IZIS). Each patient's EZK contains data structured according to the specifications and contents of the electronic record.

Records of around 80% of the health care serices in the existing IZIS (not including labs, radiology and similar services) are kept by way of the ICT. The Clinical Center of Montenegro (KCCG), which keeps its own internal records and procedures, is not connected to IZIS. Thereby, the overall percentage of the records in IZIS is reduced significantly.

Special attention is paid to the system security and data protection, considering that medical and health data require particular care in the sense of general human rights, as well as the international and national legal norms and ethical principles of data protection and their use within the health care system.

Institutional inter-connectedness and linkage to the data center of the Fund is realised as part of the procedures of connecting state institutions to the network of state organs and state administration bodies. The type of links are dominantly MPLS networks and VPN public network communications. The speed and range are not adapted to the advanced and demanding services. Such is the case of radiological information system which involves the transfer of images of great resolution and capacity. On the health system level, there is yet to be introduced a standardized document management system.

STRATEGIC DEVELOPMENT TOOLS

Strategic planning of the development of the health care information system and e-health services, aside from the direct national benefits, enables better regional cooperation. This can be seen in the efforts of the EU countries to improve e-health to the mutual benefit of the citizens and the health care system.

Seen as a use of the Internet and the related technologies in the health care system, e-health improves access, efficacy, efficiency, and quality of medical and operational processes. Its overall purpose is to enhance the health care system as a whole. The concept of e-health represents the most complex application of the information and communication technologies in the social realm. It ensures the availability of patient-related information via Internet and related technologies, regardless of where that information is needed, so that particular segments of e-health, such as the e-record, e-prescription, e-referral, e-identification, diagnostics information system, m-health, and telemedicine can be realised for the data significant for the direct segment of healthcare rights, while medical data of the patients are available within IZIS. The abovementioned is the focus of this chapter.

In this sense, a modern, up-to-date, and integrated health care system, supported by the ICT, is the central goal of e-health. Aside from the functional support, the information health system must support the health care system reforms. Activities should focus on digitalization of operational processes, reducing the costs, simplifying administrative procedures and health care system processes. The focus should be on quality, secure, and fast information exchange between all health care system users, with due respect to the privacy rights of citizens and the safety of the information regarding their health.

The development and enhancement of integral healthcare information

system and e-health is one of the priority strategic areas regarding functioning and organization of health care system at the national level (Healthcare Master Development Plan 2015-2020). Therefore, the adoption of the Strategy of the development of health care information system and e-health, while adapting to the EU standards, represents prerequisite for achieving accessible, quality and efficient healthcare and better management of the whole healthcare system. It is necessary to connect functionally all the segments of the health care protection into integral health care information system.

Due to the terrain configuration and barriers to health care in certain parts of Montenegro, the tertiary level doctors can deliver their services via telemedicine, in radiology, cardiology, emergency medical help etc, and this very interconnectedness among doctors would be of great importance for the Montenegrin population. Also, the tertiary level doctors can receive services from the doctors from other clinics in Europe and beyond, for certain methods of the health care, via telemedicine.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
The percentage of the registered electronic health care services	0%	30%	50%
Access to the data of the user of the compulsory health insurance by the electronically identified users	0%	30%	50%
The registration and deregistration of the user of the compulsory health insurance (e-service)	0%	50%	70%
The percentage of e-referrals issued	0%	30%	60%
The percentage of e-prescriptions issued	0%	30%	60%
The percentage of online appointments	0%	40%	70%

E-INCLUSION

9

The aim of this chapter is focused on inclusion of all social groups into the process of increasing the level of digital literacy, taking into account that the advanced digital society requires equality and inclusion at all levels.

According to the last OECD study, as income inequality rises, the level of economic growth falls. Therefore, measures taken against all forms of inequality contribute to the building of a just society, but they also affect the economy, making it more stable and stronger. The most common reasons for "digital exclusion" are low income and insufficient level of education of population, geographic location, culture and various forms of disability, as reported by the European Commission.

EUROPEAN CONTEXT

Improving the digital literacy, skills and inclusion represents one of the priority areas of the Digital Agenda for Europe and a key initiative of the Strategy Europe 2020, which is directed towards creating sustainable European economy and technologies accessible to all.

As reported in 2010, 30% of Europeans have never used the Internet, which explains why this issue became one of the priority areas of action. This situation came as a result of general lack of skills and insufficient level of awareness of the need for the Internet use among population aged 65 – 74. At the same time, for the population with low income, the unemployed or less educated, the main obstacle to Internet access is the price – for them, Internet is too expensive.

The accessibility and usability represent a problem for the Europeans with disability. Therefore, Digital Agenda for Europe points to the need to adjust the new electronic content in such a way so it is accessible to the persons with disability.

In addition to the legal obligations, there are also strong economic arguments that affect the area of e-inclusion. Improving e-inclusion is feasible, because it enables better access to the services for marginalized social groups, as well as meeting the requirements of inclusive digital society. Improving access to services, both private and public, opens new market possibilities for a significant part of the population, and can also help the sector of public services to play its part in a cost-effective way. Meeting the EU directives and recommendations will help along the way, in order to bring South-Eastern European countries closer to the EU Member States regarding this matter.

Electronic content should be completely accessible to the persons

with disability. It is also of great significance to harmonize the public web pages and the Internet services with the international accessibility standards. The agreements such as Strategy of the Council of Europe and UN convention on the rights of persons with disabilities, in the field of information accessibility, communication and ICT technologies, pose a demanding program of requirements in the coming years.

NATIONAL CONTEXT

In order to build an inclusive, digital society in a proper way in Montenegro, there is a need to provide equal conditions for all citizens on the way towards developed knowledge society and bridge the digital divide completely. In this sense, particular attention was paid to the universal access to the Internet and technologies in the recent years, through overcoming digital divide regarding sex and differences among demographical groups.

As reported by the Monstat, out of 68.1% of individuals aged 65-74, who have used the Internet in Montenegro, 65.9% use the Internet on a daily basis. The survey found that there are no Internet users of this age who access Internet less than once a week.

According to the MONSTAT report, issued on October 30th 2015, the computer presence in Montenegrin households differs on regional level, as well as depending on the settlement type (urban/rural).

The percent of the computer presence in the northern region is the smallest and amounts to 49.7%, while this percent is the largest in Podgorica, and amounts to 60.4%. The computer presence is larger in urban areas – 60.8% of the households in urban settlements said to have computer access, while 46.7% of the households in non-urban areas declared to posses a computer.

Internet access in non-urban areas is 52.7%, while this percent is larger in urban areas – 75.3%.

Internet access in households also differs on the basis of income. Out of the households with the income up to 300 EUR, 44.1% have the Internet access at home. Out of the households with the income between 300 EUR and 600 EUR, 76% have Internet access at home, while this percent is significantly larger for the households with the income over 600 EUR – 92.2%.

There are also differences on the basis of the age and sex. According to MONSTAT, the percent of the Internet usage is larger for men (80.7%), while for the women this percent is 78.1% (the percents are measured

among the individuals that use the Internet almost every day).

In order to overcome social and economic exclusion, the Ministry for Information Society and Telecommunications has realized a whole range of projects which involved different population categories. The program of education and evaluation of digital skills according to the ECDL standard included various social groups, such as Roma population, persons with disability, primary and secondary school students, the retired. The computer equipment was provided through donations to the best students-users of social welfare who live in rural areas, as well as associations which gather persons with disability and other vulnerable groups.

Ministry for Information Society and Telecommunications in cooperation with the Association of Youth with Disabilities and the Association of the Blind of Montenegro, created the e-accessibility guidelines, which outline the forms of e-accessibility as well as the methods to eliminate the obstacles in the process of the web pages design. The guidelines are made for everyone involved in web pages creation, with the aim to point to the importance of Internet content accessibility for the persons with disabilities.

STRATEGIC DEVELOPMENT TOOLS

The modern digital society must be built upon the principles of equality, inclusion, openness, equal opportunities. This means that every individual must be equal member and user of the digital environment, but at the same time the individual must also take part of the responsibility towards development of the society, being one of the users of the benefits the society provides. Therefore, it is necessary to integrate all the activities that reduce digital exclusion into every social care program, as well as employment programs, programs of care for the elderly, persons with disability programs, or any other program that concerns vulnerable groups.

Although enabling access to the information and communication technologies and services can provide all citizens with equal opportunities, this is not the only guarantee of maximizing the benefits of technologies that an individual or a society as a whole can achieve. Therefore, it is necessary to focus on raising general awareness on possibilities that technologies can open to each aspect of everyday life. On the other hand, creating electronic services that recognize the contribution of these groups to the society in general can help to overcome the social and economic exclusion of the vulnerable groups.

Having in mind the abovementioned, strategic tools for inclusion of the vulnerable and marginalized social groups need to be taken individually. When it comes to the rights of the persons with disabilities, there is a growing focus on their integration into information society. Therefore, it is necessary to work on application and enhancement of the existing regulation in this area, in order to adhere to the e-inclusion standards, primarily on the regulatory level. On the other hand, public institutions' web portals and e-services targeted at this population must develop in accordance with the technologies and methods that ensure the application of WAI standards. The elderly need particular support towards the improvement of their quality of life, through simplifying their access to information and communication technologies. The establishment of the volunteer education network could increase the number of the elderly who are ready to enjoy the benefits of the ICT technologies.

Various models of the Internet services should be used towards inclusion of the minority social groups and promotion of their rights. Namely, it is necessary to improve the quality of Internet content targeted at these groups. Taking into account the problem of inclusion of the young people from the rural and poor areas, it is important to use the potential of the distance learning concept (the development of e-learning platform) for the purpose of enhancing possibilities of their education. The surveys show how the insufficient level of the digital literacy of the female population represents a barrier to the e-inclusion of this segment of the population. Therefore, it is necessary to make additional efforts towards the creation of educational workshops and campaigns for women in rural areas, who use technologies at a rather insufficient level.

The accessibility to public service terminals (cash machines, tourism information offices, payment machines etc) is one of the prerequisites for participation in society and industry). The large number of technological solutions exists at the market in order to simplify further the use of the services for the customers.

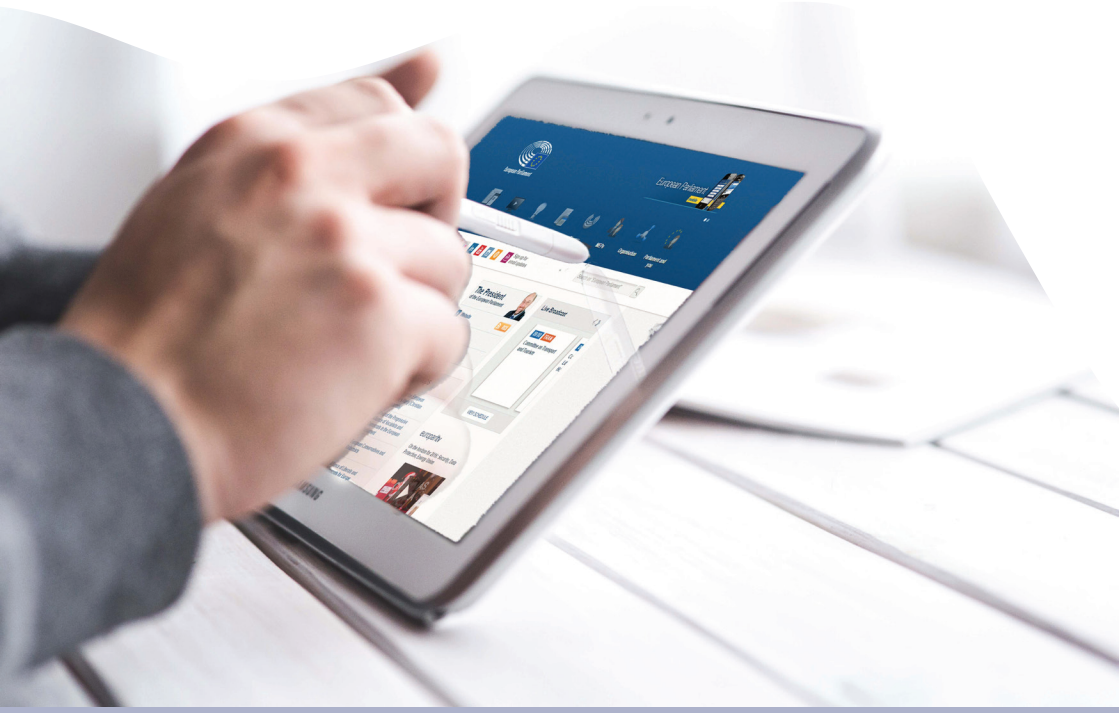
When it comes to e-accessbility of these terminals, together with the physical accessibility, it is necessary to provide the possibility of voice output of the machines, as well as tactile boards and buttons in Braille letters, so the customers with hearing disabilities can also use them.

The growing phenomenon of the "digital exclusion" needs to be viewed from both social and economic standpoints in order to determine the effects of the activities realized in the field of e-inclusion, with the aim to eliminate the "digital gap", the one

based on urban-rural division, as well as the one based on income and various social and demographic features of the population.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
The percentage of the persons with disability who use the Internet at least on a weekly basis out of the total number of persons with disability	n/a	35 %	60 %
The number of accessible web sites of the state institutions out of the total number of the web sites of the state institutions	n/a	30 %	50 %
The percentage of persons who have never used the Internet	26,4 %	18 %	13 %



E-GOVERNMENT

10

The modern environment and smart devices, social networks, the significant increase in information availability, new social and media culture and customs, represent a basis for the new business operations in the digitalized public administration. The public administration should build operational models that will remove the traditional and outdated process barriers, as well as information systems and data redundance and promote so called "lean" services, according to the principle of the single contact point and single services point (e-services) of the public administration.

The main goal of the e-government is establishing simple electronic services, horizontally and vertically integrated into national and local administration, and above all oriented towards the users, available through various channels 24/7, and customized for users' needs both regarding quality and speed.

EUROPEAN CONTEXT

European directives and recommendations in this field are outlined in the Digital Agenda for Europe 2020, the Digital Single Market Strategy and the EU eGovernment Action Plan 2016-2020.

The Digital Agenda for Europe calls for the maximum support to the innovative, crossborder e-government solutions, and it specifically points to the necessity to ensure the full interoperability of the e-government services, bridging legal, organizational, technical and semantic barriers. Towards this goal, it is important to pay care to the European Interoperability Framework EIF 2.0, and its basic principles: subsidiarity and proportionality, user orientation, inclusion and access, security and privacy, multilingualism, administrative simplification, transparency, data protection, openness, possibility of re-use, technological neutrality and adaptability, efficiency and efficacy.

The European eGovernment Action Plan 2016-2020 encompasses needs, requirements and expectations of all stakeholders, both the citizens and business, as well as the public administration.

The further development and widening of the Interoperability Solutions for European Public Administrations ISA, which particularly tackles the interoperability, but also some other e-government areas, such as electronic identification (eID), represents one of the main activities prescribed by this Action plan. In that sense, project STORK (Secure idenTity acrOss boRders linKed) is particularly prominent. Its purpose is the creation of the interoperable-crossborder system at the EU level, targeted at the verification of

the electronic identity in such a way that the national electronic identity systems can be used in all Member States. The development and implementation of the large, multi-scale projects like this one enables the creation of the innovative crossborder solutions.

The Services Directive binds the Member States to eastablish the single contact point, through which the states could provide crossborder service delivery. In addition to the single contact point, the Member States are directly bound to connect to the EU information system IMI (Internal Market Information System) which will enable business and citizens to communicate and exchange the information with public administrations of other Member States. It is the responsibility of the Member States to ensure full implementation of this system at the internal level in each Member State.

The Digital Single Market Strategy goal is to alleviate crossborder communication via Internet, enhance electronic service delivery and electronic commerce, regardless of the location of business or citizen, with the purpose to:

- Alleviate access to online goods and services for the citizens and the business
- Improve the conditions which boost the development of the digital networks and services
- Enhance the digital economy growth.

NATIONAL CONTEXT

In the recent period, the focus was on establishment of a new method of public administration operations – electronic operations, that is its direct application in projects that improve the information exchange in electronic form within state administration (G2G) as well as between individuals or legal entities and state administration (G2C and G2B). In this context, the two basic factors are recognized to develop and improve e-government: the technical-technological and the legal and organizational factors or preconditions.

Through the implementation of two important projects: the e-government portal (web-services of the the state administration) and eDMS (the electronic document management system within the state administration), technical-technological preconditions for the establishment of e-government were created.

Putting into power the Law on e-government (Official Gazette of Montenegro, no 32/14) the formal legal conditions were created for the transfer from traditional, paper-based documentation procedures to electronic document procedures.

The e-government web portal, established in 2011, as a central online point of access to the public administration services at the national and local level, enables administration to modernize and broaden its services by way of implementation of the electronic services. This is how the availability of the services increases, overcoming the barriers of working hours or location. At the end of 2015, 129 services, within the authority of 27 institutions, were available at the e-government portal. The basic division of all the e-services available at the e-government portal is the following:

- Informative e-services (level 1 and 2) – the e-services which provide only the information to the end-user or the possibility to retrieve certain forms and save them on their computer;
- Electronic e-services (level 3, 4 and 5) – the e-services that enable the end-user to start and complete the whole service, from completing and sending the electronic form to receiving the information or the document wanted.

At the end of 2015, at the e-government portal there were 35 informative e-services and 94 electronic e-services, divided according to the users:

- Individuals (citizens and entrepreneurs) – 77 e-services
- Legal entities (businesses and other legal entities) – 44 e-services
- Public administration – 12 e-services

One of the methods to measure the level of the e-services use is also a number of the registered or electronically identified users. For electronic services, there are various ways (types) of the electronic identification, from the lowest level, where no identification is required – so called anonymous login, up to the highest level of identification, where the identification with the qualified digital certificate and digital signature of e-form is required. The number of the users registered in 2015. with e-mail account is 6505, while the number of the registered users witg the qualified digital certificate (individuals and legal entities) is 58.

STRATEGIC DEVELOPMENT TOOLS

The goal of the Strategy is to ensure further development of e-government by way of increasing the number of user-oriented and business-oriented e-services developed on unique state information systems and solutions, acknowledging the fundamental principle “only once” (the citizen submits particular data

only once, and further on the data is only transferred).

Starting with the main goal of the public administration, that is its role as public service for the citizens and business, the strategic goals must be focused on electronic public services, as well as requirements that must be met by 2020, in relation to the development of the modern, digital society which uses the potential of all the information available to the public sector at a maximum level.

The interoperability system in Montenegro is still developing. It should ensure the link between the information systems formerly developed according to the system of "silos" into a unique system which will ensure overcoming the legal and organizational as well as the technical-technological barriers and differencies on the state administration level and enhance e-government. This system also, as a central interoperability system, enables public administration to exchange the information through secure channels with high level of protection and encryption which follow security conditions for system connection, particularly system of authorization with related safety certificates.

The creation of public registry should be of particular importance – Metaregistry, which functions as collaborative tool for the development of the system of connecting public registries. Aside from all the existing methods and options of connection being inserted, Metaregistry needs to ensure the coordination in changes of the registry system and create so called "referential integrity". Strategic development tools encompass several components:

- e-services – improve the existing and develop new electronic public services, including crossborder electronic services
- interoperability – establish a unique system for electronic data exchange (interoperability) at the state level
- eID – adapt the existing and develop new eID systems and mechanisms with the purpose of meeting the requirements by the service provider
- Open Data – enable availability of the public administration data in open formats for further use and processing
- Digital Single Market (DSM) – provide business and citizens with the opportunity to realize their requests to the public administration, via Internet, in accordance with "once and only" principle.

e-Services

Improving the existing and creating and developing new electronic public services as well as evaluation and enhancement of their quality, while at the same time taking into account new possibilities that emerge in the context of the dynamic development of the digital technologies, and the availability of the digital content, is crucial goal of this part of the Strategy. Reaching this goal is aimed at creation of the conditions for citizens and legal entities, but also the public administration, to access the useful, available, secure, manageable (user-friendly) tools which are adapted to various technologies. E-services provide the citizens with the possibility to use the public administration services regardless of their location and technology they use to access the Internet (hardware, software) or electronic communication channel chosen.

Particular attention needs to be paid to the crossborder aspect of certain electronic services. Namely, the EU integration process takes place in the digital world too, and therefore it is necessary to create, both legal and technological, the conditions for the implementation of the crossborder electronic services.

In the context of preparation for the delivery of modern e-services that will enable better quality of life and put a friendly face on public administration, it is necessary to perform rationalization of the administrative procedures and connect and optimize processes in various administrative institutions. This is possible only through consistent implementation and control of legal obligations regarding single access to e-services via e-government portal, along with ensuring the quality of these services expected by the user.

The main concern is users' satisfaction, taking into account availability and high level of accessibility to the different social groups. According to the Law on e-government, all state bodies are bound to prepare adequate applications for reception of all kinds of forms that can be submitted to that organ in an electronic format, with the purpose of creating conditions to file the citizens' requests via e-government portal. It is necessary to implement as many e-services from level 4 and level 5 as possible and secure full implementation of the Law on e-government in the period from 2016 to 2020.

Interoperability

At the state level, the interoperability must be based on the following presumptions: logical and purposeful circulation and use of the information, with the focus on processes and services of the public administration, open administration (tran-

sparency, participation and cooperation), the technological neutrality.

Introduction of the unique interoperability system at the national level creates opportunities to transform e-services of public administration into fully interoperable ones, while overcoming organizational, technical and semantic barriers. Reaching this goal will help avoid all the useless technical conditions such as applications that are operable only in certain technical environment, with special devices or on special digital platforms. In this manner, joint use of data will be alleviated, and the interaction between state organs will be simplified, at the same time providing users with more options, increasing efficacy, efficiency and transparency of the public administration.

The unique system for electronical exchange of information at the state level will ensure interoperability between the existing and the new information systems in public administration, at the same time eliminating duplication of their functions. According to the Law on e-government, all state bodies and public administration organs are bound to exchange data via this information system, and it that sense its implementation is absolutely necessary.

e-identification

Electronic identification (eID) represents the foundation for the legal performance of e-services. eID mechanisms exist on different levels, both internal and public. eID technologies and authentification services are of crucial importance for transactions via Internet, both in private and public sector. The most common authentification method today is password. For many applications this may be enough, but there is a growing need for more secure solutions and solutions secured by the high level of authentification. The need for different mechanisms and eID solutions is particularly evident in e-government services, depending on different requirements and needs of the service provider. Therefore, it is necessary to provide different solutions that satisfy the basic standards and the development platforms based on interoperability requirements. The improvement and adaptation of the existing and the development of the new eID systems and mechanisms represents a necessity, particularly in terms of meeting the requirements by the service provider, i.e. type and level of e-service.

Particular care should be paid to the systems that operate on mobile platform, smart phones and other mobile, personalized devices. In this context, electronic identification sy-

stem needs to be improved through the use of the mobile technology.

Open Data

Open data promote multilateral cooperation, support and enhance the development of the open, transparent and responsible state administration, binding the state institutions to promote fight against corruption and take active participation. This concept also encourages citizens and civil sector to participate actively in improving public services that the state provides. The need for the open data comes from its features. The main features of the data are: accessibility in machine-readable format, access to data as a whole, at a reasonable price which ranges within litims of the reproduction costs, the possibility to download the data, the possibility to re-use the data and redistribute it, the concept of universal participation in its use – anyone should be able to use and distribute the data etc.

Open Data concept enables the public to access integral data without obstacles and to use it in such a manner as it finds convenient, with the obligation to cite the source. In this manner, the data that is produced once gains in value by the possibility to be re-used or integrated with other data, thus becoming useful again, to the new user.

EU supports Open Data for the following reasons, recognized also in Montenegro for the purpose of improving the policy in this field:

- Open Data has a significant potential to be re-used in new products and services;
- Determinating/finding a solution for social challenges – having access to as much data as possible significantly influences the process of finding new and innovative solutions;
- Reaching higher level of efficiency through data exchange within public administration and among its various institutions;
- Enabling citizens' participation in civil and social life and increasing administration transparency.
- For all the reasons mentioned above, the standards for the Open Data will be defined and the concept and its implementation will be promoted accordingly.

Digital Single Market

The Services Directive and the Digital Single Market Strategy aim to enable business and citizens to realize their requests to public administration, through full implementation of the interoperability, via Inter-

net, according to the "once and only" principle, regardless of their location within EU. Digital single market is one of the the most promising areas of development which opens possibilities to boost economy by means of e-commerce, by simplifying administrative procedures and strengthenning e-government users. Public services developed within the digital single market are transferred from fixed to mobile platforms and they are increasingly present today, allowing the access to information and content at any time, any place and any device.

This progress demands a regulatory framework that is favorable for the development of cloud computing, connectability of mobile data regardless of state borders and simple access to information and content, followed with full protection of personal data and total implementation of cyber security tools.

The process of EU accession poses demands such as the establishment of single contact point, as well as connecting to IMI – Internal Market Information System, which will enable crossborder service provision as well as information exchange with public administration in other states.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
The number of e-services available at the e-government portal, out of the 20 priority services as listed and defined by the EU	6	15	20
The number of e-services at minimum of level	5	15	30
The percentage of the citizens that have used e-services in past 12 months	n/a	20%	50%
The percentage of legal entities that have used e-services	n/a	15	30%
The number of the electronic certificates of all types issued for the purpose of eID to access the e-government portal services	7,000	10,000	20.000

RESEARCH, INNOVATION AND DEVELOPMENT

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Smart growth, with research and innovation at its core, in addition to improving the quality of education, demands strengthening of the research capacities, enhancement of innovation and transfer of knowledge, as well as the use of ICT at a maximum level.

The development supported by innovation is not the prerogative of high-income countries anymore. Montenegro has started with the implementation of whole range of reforms with the purpose of creating a favorable environment for research and innovation. Increased regional cooperation in the field of research, increased possibilities for cooperation between research centers and private sector, as well as continuous work on legal framework, represent only some of the strategic tools targeted at advancing the state of ICT area of research and innovation.

EUROPEAN CONTEXT

European framework for research, development and innovation is defined by the "Europe 2020", strategy that combines research, education, financial support and intellectual property as the basic components of the EU development plan. The key initiative of this Strategy is the "Innovation Union", targeted at enhancement of the general conditions and financial support for research and innovation, in order to enable transformation of the innovative ideas into products and services, which will create economic growth and new jobs.

The "Innovation Union" is implemented through various structures and programs, and Montenegro is an active participant in majority of them. The European Research Area – ERA, represents a unique cooperation framework in the field of research, development and innovation in Europe.

"Horizon 2020" is the most significant EU program for research and innovation, with 78 billion euro funds at its disposal. These funds are available for the period between 2014. and 2020. The ICT is one of the priority areas financed through this program. The most significant ICT infrastructure project within H2020 program is a pan-European academic and research network (GEANT), with a whole decade of experience in providing European academic and research institutions (and not only European) with the necessary infrastructure services that enable research, development and cooperation at all levels of science and research.

NATIONAL CONTEXT

The scientific and research activity in Montenegro is realized in a total of 58 licensed scientific and research institutions in 2016. (universities,

institutes, faculties and companies). Research and development activities in Montenegro are performed by a total of 1.395 researchers. Within the total number of licensed institutions, 8 of them (13.8%) deal with the ICT as the core activity.

National science and research system is implemented dominantly through the scientific projects. During the research cycle 2012-2016, 104 projects were financed with 5 million euro within the priority areas of science, and 17 of them (14.8%) were related to the ICT scientific field.

The "Higher Education and Research for Innovation and Competitiveness" (HERIC) project finances 8 major research grants, with 2.54 million euro in the period 2015-2017, which contributes to improving the quality of of science and research system. Three projects among them (37.5%) are from the ICT scientific field.

Draft Strategy for Innovation (2016-2020), prepared by the Ministry of Science, defines the following thematic priorities in the field of innovation for the period to 2020: Energy; Agriculture and Food; Sustainable Development and Tourism; Information and Communication Technologies; Medicine and Health; New Materials, Products and Services.

The first Center of Excellence in Bioinformatics "BIO-ICT" is established at the University of Montenegro - Faculty of Electrical Engineering in Podgorica, which is funded with 3.4 million euro for the period of 3 years. The Center is financed by the project HERIC. The Center of Excellence is made of a consortium of 8 partners, and the research is conducted in 6 laboratories (2 of them are the new ones). 82 researchers work at the Center, and they come from different fields of science. 15 of them are young researchers - doctoral students and 5 of them are postdoctoral fellows. The Center of Excellence represents the interdisciplinary research center in the following research areas: ICT, agriculture and food, medicine and health and sustainable development and tourism. The main research objective of the Center is to increase the application and use of the modern ICT technologies in the areas of sustainable agriculture, crop monitoring, water/sea and forests ecosystems, development of techniques to control and reduce air pollution, analysis and standardization of food products, quality control of land and improvement of public health system.

Montenegro will soon put into operation the object is intended for science and innovation activity, "Technopolis" in Nikšić, which will contribute to: connecting science and business sector; improving the competitiveness of small and medium-sized enterprises (SMEs) and

promotion of entrepreneurship; support for new companies. All the abovementioned components enhance technological development of Montenegro.

Montenegrin Academic Network (MREN) is part of the GEANT H2020 project and the pan-European research network. This is an infrastructure prerequisite for the realization of activities aimed at the inclusion of the national scientific community in international projects in the field. 28 (48.3%) of the licensed scientific and research institutions are connected to MREN.

International scientific and technological cooperation is realized through Montenegrin participation in multilateral programs and projects: "Horizon 2020"; COST; EUREKA; NATO SpS; IAEA; ICGEB; CERN and IPA.

During the period between 2011 and 2016, bilateral scientific and technological cooperation was realized through 182 projects with 15 countries.

STRATEGIC DEVELOPMENT TOOLS

Regarding the European and national context and the fact that the ICT is one of the strongest drivers of the scientific research development in this century, it is clear the ICT should be one of the preferential strategic directions of scientific research and innovation activity in Montenegro by 2020. This can be done through the support by a number of strategic directions and activities that will make synergetic contribution to improving the overall scientific research and innovation activities, inclusion in the European Research Area - ERA, as well as the achievement of the overall objectives of this Strategy.

The support for increasing the number of research and innovation institutions in the field of ICT will be implemented through the provision of infrastructural conditions in "Tehnopolis" in Nikšić, the establishment of the first Science and Technology Park (NTP) in Podgorica, impulse centers in Pljevlja and Bar, and other programs and projects. This will contribute to strengthening the link between science, research, innovation and business. It will also enable connecting scientific research institutions and higher education institutions with the existing companies, the foundation of new small and medium enterprises, "start-up" and "spin-off" innovative ICT subjects and the creation of synergy in the system of science, research and innovation, in order to create new values that will have a direct impact on economic growth and the achievement of the projected goals.

There are ongoing preparations for the establishment of another Center of Excellence that will contribute to

improving the quality of the research and innovation, by connecting several scientific institutions and companies in Montenegro and abroad. These institutions and companies will be connected by the realization of the interdisciplinary research in priority areas of science, important for Montenegro.

Financing and enhancement of the national and international projects that are related to the ICT, or the projects supported by the ICT, is one of the important tools that will contribute to the necessary development of the scientific research and innovation activity in this field. Also, the fields of the science and the economy, in the form of the body organs involved in the development of the innovative activities in Montenegro, are of particular importance for the improvement of the use of funding instruments for innovation and the strengthening of innovation activities by foreign programs and projects as well as credit support.

The development of the Montenegrin Research and Education Network (MREN), enhancement and support to the scientific and research institutions to connect to this network and use the available services, is one of the tools that will contribute, above all, to the inclusion of the national institutions in the European research area (ERA) in terms of infrastructure. It will also enable local connection and, overall, give impetus to the development of the ICT in Montenegro. Connecting educational institutions to the MREN would contribute to the further increasing of scientific, research and innovation base of the ICT. Finally, this will enable the synergy and contribution in terms of the resources neecessary for the achievement of the mission of this Strategy.

STRATEGIC INDICATORS

INDICATOR	Current state	2018	2020
The share of the ICT in the activities of the research institutions and innovative organizations	13,8%	20%	30%
The share of the ICT in the national scientific and innovative programs and projects	14,8 %	20%	30%
The share of the ICT in the international scientific and innovative programs and projects	20 %	25%	30%
The percentage of the scientific and research institutions connected to the MREN	48,3%	60%	80%

METHODOLOGY OF THE STRATEGY IMPLEMENTATION

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The implementation of the Strategy is a complex process, with its realization further complicated by the complexity of the reality itself and the problems which couldn't be articulated at the time the strategic goals were outlined. In that sense, clear methodological plan of the Strategy implementation is the only guarantee of the achievement of the strategic goals.

In order to avoid the risks that follow the long term plans, which are often also too abstract, and with the purpose to define the necessary tools for the realization of strategic development plans in the best way possible, yearly action plans for the implementation of the Strategy for Information Society Development 2020 are to be implemented. Activities which are to be part of these action plans will be defined according to the identified development goals, with the aim of reaching the strategic indicators.

Also, bearing in mind that the indicators are targeted to 2018. and 2020, there will be a two-year overview of the efficacy of the indicators defined.

Efficient coordination, which falls with the Ministry for Information Society and Telecommunications, according to its authority, is necessary for the successful implementation of the Strategy. The Agency for Eelectronic Communications and Postal Services, the Ministry of Education and the Ministry of Health, the NGOs, civil sector, as well as other governmental and local institutions who will be recognized as the carriers of the particular activities identified to reach strategy goals. In this contect, coordination body will be formed, comprised of the subjects mentioned above, with the aim to monitor the Strategy implementation through the yearly action plans. Coordination body will define implementation monitoring and evaluation mechanisms.


MEDICAL
MEDICAL
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MEDICAL
Health Care
Doctor
Hospital
Pharmacist
Nurse
Dentist
First Aid
Surgeon
Emergency

GLOSSARY

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xDSL - Digital Subscriber Line

ADSL - Asymetric Digital Subscriber Line

VDSL - Very high bit-rate Digital Subscriber Line

NGA - Next Generation Access

DOCSIS - Data Over Cable Service Interface Specification

FTTx (Fiber to the x)- Optical fiber to the certain place

FTTP (Fiber to the premises)- Optical fiber to premises (estate)

FTTH (Fiber to the Home)- Optical fiber to home

KDS - Cable Distribution System

KDS-HFC - Hybrid Fiber-Coaxial KDS Network

HFC - Hybrid Fiber Coaxial Network

AVM content - Audio-visual media content

WiMAX - Worldwide Interoperability for Microwave Access

RLAN - Radio Local Area Network

GSM/DCS - Global System for Mobile Comunications - Digital Cellular System

GPRS - General Packet Radio Service

EDGE - Enhanced Data Rates for GSM Evolution

UMTS - Universal Mobile Telecommunications System

HSDPA - High Speed Downlink Packet Access

HSPA+ - Evolved High Speed Packet Access

LTE (Long Term Evolution)- Technology for data transfer at high sppeds in mobile networks (4G)

TRA-ECS WRC-15 - Terrestrial radio applications capable of providing electronic communications services - World Radiocommunication Conference

CEPT - European Conference of Postal and Telecommunications Administrations

IPv 6 protocol - Internet Protocol version 6

ECDL (European Computer Driving Licence) – vendor-independent European standard which defines single framework of the basic computer knowledge and skills of the end-users

Cloud Computing – represents the delivery of the computer resources and storage capacities as a service for the heterogenous group of the end-users

Startup company – new companies (beginners in business), fast-growing enterprises; this term is often related to high-technology enterprises

Spin-off companies – subsidiary company; a special form of entrepreneurial company that was previously initiated by and associated with another organization; an independent company that produces a similar product or service as its previous employer

INHOPE – network consisting of 51 lines for reporting illegal content on the Internet, developed in 45 countries, dedicated to the fight against sexual abuse of children

INSAFE – European network of awareness-raising centers regarding the Internet safety, co-financed by Safe Internet Program

G2B services - electronic services that enable online (via Internet) submission of: applications, complaints, suggestions, requests, appeals and other submissions that the business sector may submit to the public administration and get feedback on submissions filed in accordance with the law

B2B services – electronic services that enable online (via Internet) electronic interaction between the business sector and includes online (via Internet) transactions between companies (legal entities) by simplifying processes and administrative barriers which helps companies to become more competitive

G2G services – Government to Government - G2G represents the electronic interaction between the institutions of state administration and includes online (via Internet) transactions with the administration by simplifying the process, the ultimate goal being the exchange of information and sharing of resources and capacities, with the improvement of the efficiency and effectiveness of the processes of public administration

G2B services – Government to Business - G2B represents the electronic interaction between the administration and the business sector, and includes online (via Internet) transactions with the administration by simplifying processes and administrative barriers thereby helping enterprises to become more competitive

G2C services - Government to Citizen - G2C represents the electronic interaction between the administration and citizens, enabling citizens to access the information and services of the state administration quickly in an appropriate way and at any time online (via Internet)

ERP (Enterprise Resource Planning) - consists of one or more software applications that integrate information and processes across the several business functions of the company.

Radio Frequency Identification (RFID) - technologies that are used for post - sales product identification or as an integral part of the process of production and delivery of services

WAI – Web Accessibility Initiative

eID (electronic identification) - tool which provides electronic identification of an individual or a legal person in the on-line services and electronic transactions in a secure manner

ERA – European research area

HORIZON 2020 - The EU Framework Programme for Research and Innovation

COST - European Cooperation in Science and Technology

EUREKA - Europe-wide network for industrial research and development

NATO SpS - NATO - Science for Peace and Security

IAEA - International Atomic Energy Agency

ICGEB - International Centre for Genetic Engineering and Biotechnology

CERN - European Organization for Nuclear Research

IPA - Instrument for Pre-Accession Assistance

MREN - Montenegrin Research and Education Network

GEANT - Pan-European data network for the research and education community

MONTENEGRO
MINISTRY FOR
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