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ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)**

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Contribution of Bulgaria

to the CSTD 2017-18 priority theme on ‘Building digital competencies to benefit from existing and emerging technologies with special focus on gender and youth dimensions’

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**United Nations Commission on Science and Technology for Development (CSTD)
Request for inputs for CSTD 2017-18**

Priority Theme 2: ‘Building digital competencies to benefit from existing and emerging technologies, with special focus on gender and youth dimensions’

1. Can you give examples of digital competencies projects/policies in your country and how they have contributed to benefit from existing and emerging technologies? What are the main challenges confronted while trying to implement these projects/policies in your country or region?
2. Can you provide examples of digital policies/projects/initiatives to benefit from existing and emerging technologies specially focused on gender and youth? How have the policies benefited women and youth? What are the particular challenges confronted in implementing these projects?
3. How can the science, technology and innovation community contribute towards overcoming these challenges? Can you give any success stories in this regard from your country or region?
4. Could you suggest some contact persons of the nodal agency responsible for digital competencies projects/policies, particularly those related to gender and youth, as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.
5. Do you have any documentation, references, or reports on the specific examples on digital competencies to benefit from existing and emerging technologies in your country or region?

I. Introduction

The rapid development of information and communication technologies (ICT), piercing through various fields of the public and private domain, is one of the distinct traits of the modern information society. Providing for an easy creation and transfer of knowledge ICT have become a key facilitator of social and economic development and an increasingly important tool in citizens’ education, work, and social interactions.

The large adoption of ICT in almost every aspect of our everyday lives has naturally led to a need for a basic set of skills, called by many “digital competence”, as a prerequisite for the active participation in society. Generally, digital competence encompasses the knowledge and skills required for an individual to be able to use ICT to reach personal goals in their personal or professional life. Resultantly, the possession of digital competence enhances both one’s quality of life and the effectiveness of one’s work.

There is a plethora of scholarly conceptions of what digital competence exactly is¹². Digital competence should be perceived as not primarily concerned with technical skills, but more focused on cognitive and socio-emotional aspects of working and living in a digital

¹ Lankshear, Colin; Knobel, Michele (2008). Digital literacies: concepts, policies and practices. New York: ISBN 9781433101694

² . Aviram A., Eshet-Alkalai Y. (2010) Towards a Theory of Digital Literacy: Three Scenarios for the Next Steps, European Journal of Open, Distance and E-Learning. Available at: <http://www.eurodl.org/index.php?p=archives&year=2006&halfyear=1&article=223>

environment.³ Therefore the notion is a complex one and includes, apart from digital literacy, skills and abilities such as situational awareness in the digital environment, cultural competence, the capacity to retrieve, synthesize, and disseminate knowledge in different contexts, the skills to actively participate in the online community, the capacity to evaluate the reliability, credibility and legality of online content (critical media literacy), etc

Digital competence is a domain- specific category since it largely depends on context, including the person, their social and political surrounding, needs and willingness or intrinsic motivation to participate in the information society. For instance, a social activist from a developing country uses different forms of digital media and different online channels for interaction in their everyday life than a financial broker in the US. Therefore, the digital competence of the first will not be applicable and relevant to the context of the latter.

On the other hand, the technological sector constantly develops and foregoes dynamic change. This means that digital competence should also envelop the ability to keep abreast with the rapid changes in the area of ICT. Hence, digital competence should be regarded as a dynamic concept and a vital part of lifelong learning.

To sum up, the notion has three distinctive characteristics, which should be kept in mind throughout the reading of the current summary of national initiatives. Digital competence is:

- **complex**, since it is an integrated set of heterogeneous elements, including practical skills, knowledge, experiences, etc.;
- **domain-specific**, since it largely depends on the context in which a person develops their professional and social life; and
- **dynamic**, since it is defined by state of the art technology, which foregoes abrupt and constant changes.

With the digitization of everyday life, ICT is no longer a specific sector but the foundation of all modern social and economic relations. Therefore, the ability to use ICT effectively largely determines the capability of citizens to fully enjoy an aggregate of fundamental rights, such as, amongst others, the right to labour, the right to freedom of opinion and expression, the right to education, the right to participate in the cultural life of the community, the right to take part in governmental matters, the right to access to public services, etc. From this point of view facilitating the adoption of digital competence skills is a powerful tool for citizen empowerment.

However, this set of basic skills, are distributed unequally between different social groups, distinguished by criteria such as age, income, gender, education, nationality, etc. This clearly implies that not everybody is able to tap into the pool of global knowledge and enjoy the full benefits of the information society. For instance, structural barriers, gender stereotypes and negative social norms have kept women away from science, technology and innovation for a long time. At the same time, those sectors have formed models and policies that fall short of meeting the needs of women and girls, thus encapsulating even further.

This proves that the undergoing technological revolution does not only offer huge opportunities, but poses numerous threats as well. New and emerging technologies and converging applications of science and innovation can easily leave the poor and the marginalized behind, creating increasing digital divides. High levels of inequality negatively affect well-being and growth. Science, technology and innovation benefit from the input of the full spectrum of social actors, including women, young people and disadvantaged groups. Thus, one of the top priorities of public policies nowadays is to develop and adopt concrete

³ Eshet-Alkalai, Y. (2004), Digital literacy: a conceptual framework for survival skills in the digital era, Journal of Educational Multimedia and Hypermedia, 139(1), 93–106. Available at: http://www.openu.ac.il/Personal_sites/download/Digital-literacy2004-JEMH.pdf

measures for building digital competencies as a way towards achieving inclusive growth in the digital age without leaving anyone behind. Some of the measures include initiatives such as improving digital literacy, accelerating infrastructure development, promoting broader participation in research and development networks or activities, improving affordability of technology, ensuring consumer protection, etc.

The efforts to put technology in service of prosperity and well-being for all are not exclusively reserved for public actors only. The industry has acknowledged that private capital and knowledge are two complementary factors that work well together in the knowledge-based economy. Along these lines, private investment and innovation-led social entrepreneurship have also reaped effective and sustainable results in building digital competences and closing existent development gaps. This comes to show that the challenge of bridging digital divides is not only a social, but also an economical problem, calling for further research and tailored policy measures. While it needs to be addressed at large, it is also essential to consider it in relation to local settings and differences, especially in developing countries.

The aim of the current summary is to contribute to the ongoing global discussion on how to ensure technology and science and innovation remain inclusive engines for development. The summary provides a concise overview of current and past projects/policies adopted by private or public entities in Bulgaria with a focus on building digital competences. The report also takes into account the national setting, outlining how specific local socioeconomic and political factors influenced the process of achieving the desired results.

Eurostat's „Girls and women under-represented in ICT“ is published on the occasion of International Girls in ICT Day, celebrated on the 4th Thursday in April every year. It is a global initiative aimed at raising awareness among girls and young women about the importance of digital skills and encouraging them to consider studies and careers in information and communication technologies.⁴

About 1.4 million people were studying Information and Communication Technologies (ICT) in the European Union (EU) in 2015. Girls were largely in a minority, accounting for only 17% of all ICT students. Across the EU Member States, their share ranged from less than 10% in Netherlands (6%), Luxembourg (8%) and Slovenia (10%) to **over 30% in Bulgaria (34%)**, Belgium (33%) and Greece (31%). A similar pattern could be observed on the labour market. Almost 8 million people were employed in the EU as ICT specialists in 2015. The figures show that the profession was predominately male as women represented only 16% (1.2 million) of all ICT specialists employed in the EU. Across the EU Member States, women accounted for less than 12% of ICT specialists in the Czech Republic, Slovakia and Hungary, while **1 ICT specialist out of 4 was a woman in Bulgaria**, Romania and Latvia.

⁴ <http://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20170426-1>

II. Public Policies, Strategies and Measures for Building Digital Competencies in Bulgaria

According to the latest Digital Economy and Society Index (DESI)⁵ more than 47% of Bulgarian households do not use Internet regularly, which is way below the general average for the EU (31%). Three fourths of citizens do not have basic digital skills despite the growing demand by the labour market. Only 10% of Bulgarian internet users have benefited from e-Government services. This huge digital barrier has left on the inactive side mostly elderly members of society, inhabitants of regional and low-inhabited areas and ethnic minorities.

The digital gap has rendered whole rural regions of the country (nearly 4000 villages) uncompetitive and unappealing for foreign investments. The market failure of lagging-behind regions can be explained by the lack of appropriate broadband infrastructure and the insufficient digital competences of the human capital.

This clearly signals that Bulgaria is an underachiever in bridging the digital divide and is in an urgent need of effective policy measures, intervening in various key social sectors, such as education, science, entrepreneurship, the labour market, the private sector, etc. At the same time there are some national policies that could be further developed to contribute significantly towards advancing the digital competencies in Bulgaria.

1. Horizontal Policies

One of the main strategic policy documents setting forth the current priorities of Bulgaria in the global process of digitization is “**Digital Bulgaria 2020**”⁶. The document was developed under the auspices of the Ministry of Transport, Information Technologies and Communications, which is the leading institution for developing, adopting and implementing state policies in the field of ICT and innovation.

Some of the impeding issues, outlined in the strategic document, are closely connected with the topic at hand, such as:

- an increasingly slow process of bridging the digital divides due to the lack of a healthy market for affordable and cost-based ICT products in remote and low populated regions of the country;
- limited opportunities for enhancing the digital literacy and competency of citizens and especially for disadvantaged individuals;
- lack of appropriate media and educational content for creating a healthy environment of lifelong learning;
- a growing shortage of highly-qualified working hand in the high-tech sector.

Building upon the identified issues, the strategy sets one out of its six priorities as: “**Overcoming the digital divide by enhancing digital literacy and stimulating the broad adoption and use of ICT by citizens, businesses and the public sector.**”

The priority is envisaged to be achieved by implementing the following measures:

- ensuring universities and schools have access to a high-speed broadband Internet connection;
- ensuring open access digital content for students from every level of the educational system;
- modernizing the educational curriculum in the field of ICT in accordance with the needs of the labor market;

⁵ The country’s 2017 profile is available at: http://ec.europa.eu/newsroom/document.cfm?doc_id=42993

⁶ Available in Bulgarian at: www.strategy.bg/FileHandler.ashx?fileId=6136

- enhancing the digital competency of teachers and upgrading the system for evaluation and assessment of learning outcomes and professional developments;
- stimulating closer cooperation between the educational institutions and the industry, including a mutual process of preparing the educational curriculum for students, establishing targeted scholarship schemes, etc.;
- validating and certifying learning outcomes, knowledge, skills and competencies, developed by formal and non-formal learning in the field of ICT;
- supporting the adoption of ICT-based product, process or management-innovations by undertakings from other sectors of the economy with a special focus on SMEs;
- building portals facilitating e-commerce and other forms of digital business models;
- developing ICT-based health and social services;
- stimulating the use of ICT in fields like resource and energy management, ecological monitoring and preservation, water and waste management, ecologically friendly and energy-efficient transport; facilitating mobility by integration of Intelligent Transport Systems, etc.
- supporting the digitization of cultural, scientific, journalistic and other content by public and private libraries, archives, museums and compendiums, which should be freely accessible for the artistic industries to be used for the development and offering of innovative services and applications;
- stimulating the provision of open data from the public sector in order for the industry to develop and offer better services with added value (i.e. in the touristic or artistic industries);
- stimulating the use of the large potential of big data along the whole value chain starting from the stage of research and development to the stage of added-value service or product production; and
- digital inclusion of disadvantaged individuals and ensuring the accessibility of interactive on-line services, including enhancing the opportunities for long-distance flexible and hourly-based labour (including for mothers).

Another digital competence-related policy measure is set forth in the “**National Strategy for Lifelong Learning (2014-2020)**”⁷ adopted by the Ministry of Education and Science. The document acknowledges that many of the public libraries in Bulgaria already provide free trainings for attainment of digital skills for various target groups such as pensioners, children, people with special needs, etc. One of the aims of the Strategy is to use this existent network of libraries as a tool for enhancing basic digital skills, which in turn would supposedly evolve into permanently attained digital competences. Therefore, the Strategy includes as a targeted measure the promotion of the network of public libraries on local and regional level and their assertion as centres of attainment of digital competences.

2. Education

Another relevant policy document with a primary focus in the field of education and science is the “**Strategy for Effective Implementation of Information and Communication Technologies in Education and Science in the Republic of Bulgaria (2014-2020)**”⁸. The document was authored by an expert working group at the Ministry of Education and Science and envisages the long-term vision, aims and measures for modernizing the science and education sectors in accordance with the emerging realities of the information society. The strategy outlines several primary aims:

⁷ Available in English at: <http://www.strategy.bg/FileHandler.ashx?fileId=9418>

⁸ The document is available in English at: <http://www.strategy.bg/FileHandler.ashx?fileId=9415>

- to create equal opportunities for access to quality education regardless of place of residence or level of education by integrating modern ICT in the system;
- to form personalities, well-prepared for living in the information society with all its opportunities, threats, challenges and risks; and
- to ensure a smooth, effective and manageable transition of the society towards the knowledge economy.

One of the priorities of the Strategy is to make a progression from traditional to a fully cloud-based distance and mobile education (m-Learning) system. The adoption of this new model will supposedly allow for greater flexibility and efficiency, will lower existent social barriers and will bring equal opportunities for education. According to the Strategy, achieving a functional e-learning model is not an ultimate goal itself but an interim measure towards establishing a “ubiquitous learning” or “u-learning” system in the foreseen future.

Bearing in mind the long-term goals, perspectives and sustainability of the Strategy, the document also acknowledges the key need for development of human potential in the system. Therefore, the document also sets forth sub-priorities, such as:

- creating conditions for lifelong learning for the greater part of the economically active population;
- developing a large-scale system to enhance the information and computer literacy of the population, to update or adopt standards and conditions for training and certification, to introduce courses for people with special educational needs; and
- changing the forms and methodologies of education at all levels based on extensive use of ICT, which will require a finalization of ICT implementation in education, finished development of study programs and scientific content and a sufficient methodological qualification of teachers for ICT use in education and research.

Special focus is put on the constant and incremental qualification of teaching experts in terms of computer literacy, which will enable them to choose and use methods and means to reach the respective educational goals in a flexible and mobile information environment.

3. Economy

The innovation strategy for smart specialization(ISIS) adopted by the Council of Ministers Decision No. 857 / 03.11.2015 provides for Bulgaria to make a qualitative leap forward in the development of innovation by 2020. The strategic goal of ISIS is by 2020 to move from the group of "incomplete innovators" to the group of "moderate innovators". The achievement of this goal is linked to an effective growth policy based on the competitive advantages of industry and research. It will be realized with the achievement of two operational objectives:

Objective 1: Focus on investment to develop innovation potential in identified thematic areas (to create and develop new technologies leading to competitive advantages and increasing the added value of national products and services).

Objective 2: Support for accelerated learning of technologies, methods, etc.,for improving resource efficiency and ICT implementation in enterprises across industry.

In innovation strategy for smart specialization of the Republic of Bulgaria (2014 - 2020), particular attention **is** paid to measures to achieve smart, sustainable and inclusive digital growth based on the development of balanced innovative ecosystem in ICT through ICT research infrastructure and innovation - technology parks, business incubators, clusters, centers of competence , e-infrastructure, etc., support for the growth of the ICT sector and

support for the widespread implementation of ICT in the priority industries and especially in small and medium enterprises.

Additionally with Protocol Decision No 37 of 30 August 2017, the Council of Ministers approved the "Concept of Digital Transformation of Bulgarian Industry (Industry 4.0)" as the basis for developing a Strategy for the Participation of Bulgaria in the Fourth Industrial Revolution. to create prerequisites for modernization, automation and competitive positioning of the Bulgarian economy in the medium to long term (2017 - 2030).

The adoption of the Concept will allow for the adoption of specific policies and measures to digitize the real economy and the manufacturing sector. The areas of intervention that are covered in the Concept of Business Digitization, Export Orientation and Competitiveness are as follows:

Direction 1: Strengthening the relationship between science and industry in the country and accelerated integration of Bulgaria into European and international programs, initiatives and networks related to the development and implementation of Industry 4.0.

Direction 2: Technological renewal of the Bulgarian economy through: implementation of standards, building of infrastructure, development of specific mechanisms to stimulate the development and market introduction of technological innovations (new products, services and production processes) through the technologies of Industry 4.0.

Direction 3: Building human, scientific, organizational and institutional capacity for development of Industry 4.0 in Bulgaria.

4. Healthcare

The “**National Health Strategy 2020**”⁹ is the main strategic policy document in the healthcare sector. The document touches upon the topic of digital competences in its vision for developing e-health and telemedicine systems in Bulgaria. The Strategy acknowledges that integrating ICT in healthcare would bring various benefits, such as facilitating accessibility of health services, promoting transparency and accountability in the management of the healthcare sector, driving research and innovation and allowing a more effective use of pharmaceuticals.

The Strategy also envisages an actualisation of the curricula towards the inclusion of more practical knowledge about the contemporary technological tools used in the medical profession.¹⁰

5. Government Sector

In 2014 Bulgaria adopted the “**Public Administration Development Strategy**”¹¹ as a guideline document for the adaptation of the Bulgarian administration to the growing needs for quality public services and the limited public resources to support the required changes. In order to tackle this challenge, the strategy relies, inter alia, on improving the technical competence of the administration and effective use of new technologies in its work.

A central role in the achievement of this long-term goal was given to the Institute of Public Administration of Bulgaria (IPA). IPA is the central institution, providing trainings for civil servants from all levels (central, regional and local) of the public administration in Bulgaria.

⁹ Available in Bulgarian only at: http://www.mh.government.bg/media/filer_public/2016/09/12/nzs_2020.pdf

¹⁰ See section 2.7.7 ibid

¹¹ Available in English at: <http://www.strategy.bg/FileHandler.ashx?fileId=4647>

In order to provide equal opportunities and improve the quality and affordability of education, IPA developed an online educational platform, allowing some of the trainings to be conducted without the need of physical attendance from the participants' side. This shift from IPA's traditional classroom methods to more innovative "blended learning" and fully distant learning provided civil servants with the opportunity to improve their skills at their place of employment, saving scarce public resources for travel, accommodation, and various other expenses. This benefited mainly administrations from regional structures, where employees are in the largest need for digital skills improvement, but find it difficult to attend educational activities in person. According to data, published by the IPA¹² in 2016 62% of participants in online educational modules were members of regional and small-town administrations. Currently, IPA boasts a diverse catalogue of trainings, providing basic and more advanced knowledge and skills about technological topics, such as e-governance, information security, open data, electronic signatures and documents, cloud technologies and even smart-city management. Statistically, IT and e-governance trainings remain the most popular amongst civil servants. According to data, published by IPA¹³ a total of 5458 individuals have successfully completed IT and e-governance trainings in 2014, which is about 25% of the number of total participants in IPA trainings for the year. This is a clear indicator that digital competence topics pose high interest and demand further development and accessibility.

III. Community Efforts and Private Initiatives

As noted earlier, entities from the private sector such as think tanks, corporations, separate citizens, industry and labour associations are also active participants in the efforts to achieve inclusive development by building and promoting digital competencies. Amongst the most common tools used by this group of actors are online platforms, competitions, training events, workshops, round table discussions, funding programmes. In terms of continuity, both incidental and long-term initiatives can be observed with the latter prevailing over the former. Some of the most prominent examples will be observed in more detail below.¹⁴

1. Empowering Gender

a. Entregirl and DigiGirls Initiatives by the Bulgarian Centre for Women in Technology

Entregirl is a project by the Bulgarian Centre for Women in Technology (BCWT) with a special focus on enhancing entrepreneurship skills amongst women aged between 16 and 25. The project is envisaged in the form of a competition for innovative and large-scale ideas with special support and prizes for the best-performing participants. Entregirl provides young female entrepreneurs with the opportunity to benefit from curated workshops, active mentorship and to participate in organized travels and sharing of experience with other influential women in the business sector.

¹² Available in Bulgarian only at: <http://www.ipa.government.bg/en/node/541>

¹³ "Analysis of the needs for education in the public administration of Bulgaria 2015-2018", conducted by the IPA, available in Bulgarian only at: http://www.ipa.government.bg/sites/default/files/tna_12_12_2015-saglasuvan.pdf

¹⁴ The list of projects and initiatives is far from exhaustive and serves as an exemplary summary of some of the most sustainable initiatives.

By encouraging entrepreneurship, the long-term aim of Entrepregirl is to empower women as drivers of positive societal change and to ensure that more women in Bulgaria and in the world in general become part of the development of the digital industry.

The project has already experienced four consecutive editions with more than 200 participants, producing a catalogue of freely available videos of workshops, lectures and discussions, conducted in the previous editions of the project. Entrepregirl also plans to develop and publish online a separate guide for women-entrepreneurs, containing advices on how to overcome financial and organizational hurdles in the first steps of a start-up.

BCWT has also participated in other woman-empowering campaigns with the latest being DigiGirls in collaboration with Microsoft, Bulgaria as part of their wider social responsibility YouthSpark campaign. DigiGirls is targeted at middle and high school girls and aims to raise awareness about careers in technology by connecting participants with inspirational Microsoft employees and providing hands-on computer and technology workshops

b. “Women in Tech – Digital Industry Leadership” Award, Webit Foundation

Webit.Foundation is a non-for-profit international organization that organizes a series of annual events in Sofia, Dubai, New Delhi, Istanbul and Singapore with a special focus on technology, innovation and development of the digital economy. The organization commits its annual profits from the Webit Series of events to foster the development of the start-up and innovation ecosystems in the regions where the global events take place.

This is achieved by accepting grant applications by start-ups in each annual Webit event. A global committee selects the top 5% and provides them with grants totalling in up to €200 000 including free services, such as access to Webit, exhibition booths, marketing services and an access to the network of global business and policy leaders that participate in the events.

A separate part of the Webit Events is also the Webit Awards for the digital industry for members of government, academia, enterprise, civil organizations and separate individuals that have proven outstanding leadership in the digital transformation of business and society. One of the multiple categories in the initiative is the Women in Tech – Digital Industry Leadership Award which recognizes the remarkable achievements of women in the tech sector. The award is aimed at females who occupy high positions in companies from the digital industry, and thus promotes both social and industry approval of more females in the sector and encourages the female gender to pursue leadership.

c. “For Women in Science” Initiative by UNESCO Bulgaria, L'Oréal Bulgaria and Sofia University “St. Kliment Ohridski”

“For Women in Science” is an international project, established in 1998 by UNESCO and L'Oréal with the aim to support women with outstanding professional accomplishments in the science sector. The project was adopted on a national level ¹⁵ in 2010 with the help of the local branches of the founding organizations, together with a third national partner in the face of Sofia University “St. Kliment Ohridski”. The project annually awards up to three outstanding female scientists in their PhD or post-doctorate level by providing them with a financial support of 5000 €. Candidates must be working in the field of physical and life sciences and must be below 35 years.

d. Rails Girls Sofia

¹⁵ Website of the Bulgarian edition of the project: <http://zajenitevnaukata.bg/>

“Rails Girls Sofia” is a part of a global non-profit community, empowering women by providing them with practical web-development programming skills. “Rails Girls Sofia” organizes two-day workshop freely available for females with none or close to no experience in the field of programming and technology. The workshop provides participants with basic web-programming knowledge with the programming language of Ruby on Rails. By making technology and programming more approachable for women, the project aims to make the tech sector more inclusive and less prejudiced towards the participation of women.

2. Youth

a. Project “Comp-pass” by Know and Can Foundation

“Com-Pass” is a project funded by the European Commission under the Erasmus Plus program. The target group of “Comp-pass” is young Europeans, who are not in employment, education or training (NEETs) and have thus become subjects of social exclusion. The aim of the project is to find an innovative educational approach that will foster the social inclusion of this target group by enhancing their skills, competences and confidence. For achieving the mapped goals, the project relies heavily on digital tools, such as the method of digital storytelling, the establishment of an e-portfolio platform that will help the people involved in the project build a strong CV, receive references and recommendations by employers, access useful information for employers, training centres, hosting organisations, etc. The project also envisages separate educational activities for the development of IT competences.

One of the project partners is the non-governmental organization Know and Can Foundation, which was founded in 2007 in Sofia, Bulgaria. It is developing programs, courses and activities in the sphere of non-formal and informal education and trainings. The majority of the organization’s projects involve the use of ICT for education and training with a special focus on marginalized or disadvantaged citizens. As one of the national partners in the “Comp-pass” project Know and Can Foundation will have to pick 10 Bulgarian NEETs who will have the opportunity to benefit from the project training sessions, mentorship and coaching activities and the e-portfolio platform, providing various services and digital content.

Although the project is still ongoing, it has already produced its first intellectual output in the form of a Digital Storytelling Guidebook. The document is a capacity-building tool for youth workers and other professionals working with socially excluded young people. It aims to support youth workers in delivering training courses through the storytelling methodology. The guidebook provides practical information about the digital and visual context of telling a story, its technical constraints, digital technologies used and the process of creating a digital story, from the designing and shooting, to editing.

b. School of Robotics by RoboPartans Group

RoboPartans Group is a Bulgarian private organization, focused on building robotics academies and providing robotics trainings for both mentors and students. The long-term aim of the organization is to foster a wider interest in Computer Sciences, Physics, Mathematics and ICT and to improve the student curriculum in those specific fields. The company develops and provides software solutions, curriculum, training, infrastructure and certification to organizations who wish to build their own schools of robotics. At the same time, it manages its own private School of Robotics, alongside an academy for programming, 3D printing and animation and an online shopping platform for robot sets and other robotic

merchandise. RoboPartans is an award winner in numerous rankings for emerging profitable businesses, innovative teaching methods and successful entrepreneurship.

c. Entrepreneurial Culture by Junior Achievement Bulgaria and ABLE Bulgaria

Several organizations in Bulgaria operate in the field of entrepreneurship education for young people. Entrepreneurship education is a powerful tool in the fight against unemployment and social exclusion, especially amongst young people. Participants in entrepreneurship education are more likely to start their own business and their companies tend to be more innovative and more successful than those led by persons without entrepreneurship education backgrounds are. Entrepreneurship education alumni are at lower risk of being unemployed. Entrepreneurship education is also closely connected with innovation and digital competences since it teaches young people how to effectively use technology for the achievement of their own personal and business endeavours. Therefore, entrepreneurship education has an enormous impact on individual, institutional, societal and economic level.

The leading organization in the entrepreneurship education network in Bulgaria is Junior Achievement, Bulgaria (JA). JA was established in 1997 as the local representative of the global non-profit network Junior Achievement Worldwide. JA organizes numerous events, competitions, advanced courses and programs with the aim to provide career guidance and develop knowledge and skills related to leadership, innovation and technology, finance, personal development etc.

The Association of Bulgarian leaders and Entrepreneurs (ABLE) is another non-profit organization committed to promoting civil society, leadership and entrepreneurial culture in Bulgaria. ABLE's initiatives are mainly focused on students in the university or high school stage of education or older working professionals. ABLE's tools for influence include start-up competitions, coaching and mentoring programs, roundtable discussions and networking events. ABLE is also the creator of the project Leadership.bg – an online platform for leadership skills and personal development.

3. Education

One of the most important aspects in the effort to build effective digital competences is school education. A trend observed in this field is the emergence of various civil society organizations and company initiatives, established with the objective to modernize the existent educational tools, methodology and curriculum and to spark a wider interest in subjects such as Computer Sciences, Mathematics, Software Engineering, Robotics, etc. Some examples from this group of initiatives will be explored below.

a. DigitalKidZ Open Source School by DigitalKidz Foundation and KidsInTech

DigitalKidz Foundation is a non-profit from Sofia, Bulgaria, with the aim to increase digital literacy amongst children and to seek innovative education approaches to be embedded in the education system for the long-term benefit of students.

The activity of the organization stands on the borderline between two separate fields: promoting and developing digital competences amongst young people, parents and teachers; and transforming the educational process in Bulgaria towards more interactive learning environments by integrating ICT.

According to their manifesto¹⁶, the mission of DigitalKidz Foundation is to:

¹⁶ Available at the homepage of their website.

- Redesign education to include Digital Literacy and 21st century skills Program in every school in Bulgaria;
- Disseminate a basic curriculum that defines the standards of ethical behaviour on digital platforms – for K-8 students;
- Educate and empower teachers about Digital Literacy and how to transform educational process according to the 21st century skills;
- Educate and empower parents about technology and important behavioural guidelines involving the use of digital media; and
- Create 21st century educational programs, STEAM edu tools/games.

A similar initiative is carried out by “Kids in tech”, which organizes workshops for children aged between 6 and 12 with the purpose to prepare them for the future professions in the information society. The workshops combine lectures in basic digital competences, such as robotics, programming and digital creativity combined with sport and artistic activities, which make the learning environment more engaging and less monotonous for the young learners.

b. CoderDojo Bulgaria by the Digital National Alliance and Partners

CoderDojo is a global network of free volunteer-driven programming clubs for children. The initiative allows children and young people between the ages of 6 and 16 to learn, using mentor volunteers, how to program and create websites, applications and games to explore the possibilities of technology. CoderDojo Bulgaria does not aim to make every child a programmer but to develop its digital skills through non-formal education. Programming, like math and foreign language, develops valuable skills such as logic, problem solving, creative and analytical thinking. In the future, ignorance of the computer language will be commensurate with being illiterate. The awakening of children's interest from an early age and going the distance between a consumer of technology to inventor and creator is of the utmost importance for the creation of an intelligent and inventive generation.

The format of CoderDojo offers the opportunity to include children of different ages and with different skills and interests, as well as with different frequencies of visits. The first two workshops involved more than 50 children being guided by 30 mentors - volunteers. The main goal is to create Dojo workshops in schools in the country where children can develop their skills and increase their curiosity about technology.

c. Daskal.eu, Ucha.se, Classroom.bg

The Daskal.eu initiative uses the online platform model to bridge students and teachers by providing technological tools for setting up virtual classrooms and real-time video streams. Amongst the users of this type of platform are free-lance teachers, students in need of extracurricular classes and, in some cases, whole schools conducting some of their classes distantly.

Other type of platforms, i.e. Ucha.se and Classroom.bg, provide learners with a rich catalogue of pre-recorded video classes, some of which free. The video classes are grouped in terms of grade and subject and are accompanied by interactive practical exercises after each lecture, allowing for a personalized learning experience. Ucha.se has also come up with a method to incentivize young learners to perform better and to take up as many classes as their time allows them to by establishing a public scoreboard of the accomplishments of all students participating on the platform.

d. “Future is code” Initiative by the Digital National Alliance and The Ministry of Education and Science

“Future is code” is a public-private initiative, in the form of a platform, connecting enthusiastic software engineers with local schools. Professional software engineers can enrol via the platform and receive the opportunity to talk in front of students about the passion and benefits behind their profession. The initiative is supported by a large number of schools and local IT giants, such as Telerik, Intel, Oracle, VMware, Microsoft, HP, SAP, etc. Each professional is granted the freedom to choose an educational institution and a lecture topic. The long-term aim of the initiative is to provide young people with inspiration about their future careers and to spark interest for a profession in the IT sector, which shows a growing demand for human capital which is, alas, hardly met.

4. Industry Efforts: SoftUni Foundation by SoftUni, Telerik Academy by Telerik, Muffin by Musala Soft, SAP Geeky Camp by SAP, CodeIT

Being the capital of Bulgaria Sofia has the reputation of an innovation hub with a plethora of large software companies and a vibrant start-up community. This healthy high-tech environment has produced a plenitude of similar IT academies, supported by industry professionals and targeted at individuals with relatively low digital knowledge but with passion for work in the IT sector.

Software University is a one-of-a-kind private-collaboration in the form of a university institution providing full academic curriculum in software engineering. The institution, being founded by active IT professionals, maintains close ties with the industry, thus creating a healthy environment for practical knowledge acquisition and immediate post-graduation job finding.

Similar professional education initiatives are provided by various other members of the IT industry. Among those are Telerik Academy, Muffin and SAP Geeky Camp, creating a ‘win-win’ situation in which participants enhance their digital competence and the industry ‘talent spots’ students for future recruitment.

Another effort of the industry in promoting digital competences is CodeIT – an annual competition in Informatics. Participants are challenged to solve algorithmic problems and code-building tasks.

5. Professional Associations’ Efforts: MyCompetence Portal by the Bulgarian Industrial Associations

MyCompetence is created within the project “Development of a Workforce Competence Assessment System by Sectors and Regions”. The project is carried out by the Bulgarian Industrial Association (BIA) in partnership with the Confederation of the Independent Trade Unions in Bulgaria (CITUB) and the Confederation of Labour „Podkrepa” and the financial assistance of the European Social Fund. MyCompetence’s objectives are:

- to create functional compatibility and possibilities for integrated data usage;
- to generate and collect in one place information and know-how with regard to managing the implementation process of the competence approach in human capital development;
- to support and initiate effective measures (at sector and regional level) for employment and skills development of Bulgaria’s workforce;
- to incorporate good practices from the implementation of the human resources management process;
- to create a library with the possibilities for support of lifelong learning;

- to provide relevant materials for the support of lifelong learning;
- to allow finding and storing of published documents which can be analysed in order to outline trends and recommendations.

The functioning and effectiveness of MyCompetence is ensured by the National Competence Assessment Network which encompasses employers, managers, specialists, consultants, state experts and experts from other institutions. The main users of MyCompetence are:

- Organisations (managers, HRM specialists, competence assessors);
- Ministries, agencies and other institutions and organisations related to the labour market and the spheres of education, continuous learning, recruitment and employee leasing, career guidance;
- Higher education institutions, vocational schools, licensed centres for vocational training;
- Organisations providing services in the spheres of recruitment, management, training and development of human resources;
- Workers and employees legally employed by organisations; and
- Students.

A sector competence model includes: a list of key positions in the sector, a description of the key business processes, and a catalogue of core, managerial and specific competencies typical for the job positions included. A sector competence model supports improvement in qualifications by providing transparency with regard to the qualifications needed for working as a professional in a particular role in the sector or in a particular organisation. It acts as link between an employer, an employee and a student by describing the competences necessary for workplace success. Competencies in the sector model are grouped into three main clusters: core competencies, managerial competencies, and specific competencies.

The selection and description of competencies is done according to the qualification levels set out in the National Qualifications Framework (NQF). Each competency is related via a code to the clusters created in MyCompetence and the respective NQF qualifications.

Knowledge and skills included in the job description are organized and classified on the basis of specially developed customized MyCompetence classifiers. In addition to education requirements, degrees and education institutions recommended for work in the sector (specific universities and vocational schools) are listed along with the corresponding NQF qualification level.

Although the initiative is not limited only to women and youth or people with disabilities/disadvantages, it covers the widest range of target groups possible and not only create awareness on the digital competence requires in specific economic sectors but also further develops the digital competence of the user of its services per se.

IV. Challenges

Based on the exhaustive reviews of national initiatives and practices, we could list the following main challenges towards building digital competencies to benefit from existing and emerging technologies, with special focus on gender and youth dimensions:

- Insufficient public interest in the initiatives and the opportunities they provide**
- Lack or inadequate number of policies and initiatives targeted at specific groups (women, youth, ethnic minorities), only general and horizontal measures**
- Lack of efficient public-private collaboration** (promising exception: Sofia Tech Park)
- Lack of awareness about the benefits of ICT for work, leisure, education, science, provision of public services** - policymakers, regulators and incumbents should be aware that building digital competence would provide long-term benefits such as economic development, competitiveness and social inclusion

- e. Lack of state support for promising private initiatives**
- f. Low level of continuity and sustainability in the realization of policy measures**
- g. Narrow and underdeveloped market for cost-oriented and affordable technology products and services** (promising exception: Pravetz phones and laptops).

V. Conclusions and Recommendations

Despite the obvious efforts of both private and public actors, evidently, there is many more to be done in the effort to close or at least shrink the existent digital divide. In conclusion, the position of BAIT is that the following policy recommendations could be made:

- There is a constant stream of new educational initiatives focusing on the enhancement of digital competences. However, private and public efforts are rather chaotic, uncoordinated and do not build on each other. Coordination and succession on a horizontal level can easily be accomplished with the adoption of a tailored long-term state policy.
- An effective policy for inclusion can only be achieved after a clear identification of the impeding factors which need to be dealt with. Therefore, more careful holistic research is required on pinpointing the local context-specific barriers for inclusion (prejudice, lack of skills, unattractiveness, etc.).
- Taking into account the high interest and rich choice in private non-formal education initiatives (CodeDojo, DigiGirlz, RoboPartans), a policy fostering partnership between schools and these private initiatives is highly recommended, i.e. schools can push non-formal education amongst their students by promoting private initiatives as additional extracurricular activity taking place in the school building after school hours.
- As mentioned earlier, education is one of the key components in the effort to build digital competences and achieve inclusive development. However, the specific needs of groups, prone to exclusion, such as females, ethnic minorities, etc. should be taken into account from the design stage of an educational curriculum. An inappropriate choice of pedagogical approaches may lead to unattractiveness, inefficiency and even a widening of the social divide.
- More advanced digital competences and an inclusive information society can be achieved by a policy encouraging the production and dissemination of affordable and cost-oriented technological devices. Schools can ensure each student has their own laptop device they can use for both curricular and outside-school activities. There are various low-cost devices that are affordable and student-friendly at the same time, such as most Google Chromebooks or the Bulgarian Pravetz smart phones and laptops.
- In a clear contrast with the tech industry, the science community is rather inactive in its efforts to promote an inclusive environment. Private initiatives in the sector remain rather sketchy and insufficient, thus further encapsulating the science community. Therefore, a policy containing the necessary incentives for public and private action in the field is highly recommended.

Sources:

Bulgarian Association of Information Technologies (BAIT)

www.bait.bg/?set_language=en

It is established in 1995, having 100 companies directly employing, 16200 ICT specialists and generating BGN 3.68 billion annual turnover or 4% of the country's GDP. Companies cover the entire ICT spectrum - software, hardware, telecommunication, system integration, finite, and the Internet of Things. BAIT is a member of the European IT Association Digital Europe, whose board has its own representative. Digital Europe is representing the digital industry in

Europe, it unites 63 of the largest global IT corporations, telecoms and consumer electronics companies, as well as 37 national associations, including BAIT.

Ministry of Economy www.mi.government.bg/en

Ministry of Transport, IT & Communications <https://www.mtitc.government.bg/en>