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Digitally empowered Generation Equality

Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries

In partnership with:

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ITU

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International Telecommunication Union

ITU is the United Nations specialized agency for information and communication technologies (ICTs). ITU is committed to connecting all the world's people, wherever they live and whatever their means. Through its work, ITU protects and supports everyone's right to communicate.

This report was developed under the umbrella of the regional initiatives for Europe, within the framework of accessibility, affordability and skills development for all to ensure digital inclusion and sustainable development. ITU is deeply committed to implementing these objectives as a means of paving the way for sustainable development.

United Nations Entity for Gender Equality and Women's Empowerment

UN Women is the United Nations organization dedicated to gender equality and the empowerment of women. A global champion for women and girls, UN Women was established to accelerate progress on meeting the needs of women and girls worldwide. UN Women supports United Nations member States as they set global standards for achieving gender equality. It also works with governments and civil society to design laws, policies, programmes and services to implement these standards. It supports women's equal participation in all aspects of life, focusing on five priority areas: increasing women's leadership and participation; ending violence against women; engaging women in all aspects of peace and security processes; enhancing women's economic empowerment; and making gender equality central to national development planning and budgeting. UN Women also coordinates and promotes the work of the United Nations system to advance gender equality.

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Executive summary

Digital technology has never been more integral to people's lives. Over 90 per cent of jobs worldwide already have a digital component, and many will soon require sophisticated digital skills.[1] During the COVID-19 pandemic, digital technology has become a lifeline for millions around the world and a critical tool for coping with the crisis and its aftermath. While the pandemic is causing dual health and economic crises, it also represents a historical opportunity to accelerate the digital revolution.

This report focuses on women and girls using, studying and working in digital technology in five Western Balkan States (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia) and three Eastern Partnership countries (Ukraine, Georgia and Moldova). On the surface, these eight counties are well poised to take advantage of the new digital economy, as they have a high degree of digital access and connectivity and populations with strong academic foundations in mathematics and science. In fact, in five of the eight countries profiled, women comprise more than 40 per cent of university graduates in science, technology, engineering and mathematics (STEM) fields.

However, women's involvement in STEM in the Western Balkan and Eastern Partnership countries does not translate into strong participation in technology sectors; across all eight countries profiled, the number of women working in ICT industries, founding or investing in technology start-ups or serving as high-level managers or directors in technology companies remains remarkably low. Challenges – ranging from cultural norms and biases to lack of self-confidence and online and offline harassment – hinder girls and women's full participation. The digital acceleration fuelled by the COVID-19 pandemic represents an historic opportunity to transform women's involvement in technology in the region.

STEM education is the first key area that is ripe for change; long before the pandemic hit, demand for digital skills across Eastern Partnership and Western Balkan countries was already prompting curriculum overhauls. While schools across all eight countries are evolving by incorporating digital literacy and twenty-first century skill-building into coursework, education ministries are not doing enough to ensure that girls benefit equally.

Furthermore, formal educational reforms are slow. The onset of COVID-19 exposed weaknesses within school systems, such as the lack of digitally competent teachers and gendered differences in access to devices and technology platforms. For example, girls and women's access to technology is more often controlled by family members, and they may have reduced access to digital devices within their families. The pandemic also highlighted the intersectional nature of digital divides, which are wider in rural areas and among communities with lower educational and socio-economic status.

Even as formal and informal STEM education systems are evolving, the ICT industry is suffering from a shortage of qualified talent. Outdated teaching methods lead to a mismatch between academic skills and real-world industry needs. This has particular implications for women, who are less likely to apply for high-tech positions without practical experience and knowledge.

[1] https://plan-international.org/education/bridging-the-digital-divide

Investigating and fixing the "leaky pipeline" of women leaving technology is key to both promoting gender equality and growing national economies.

Similar challenges were found in the start-up sector across the region. While a nascent ecosystem of start-up and innovation hubs in the Western Balkan and Eastern Partnership countries has emerged, the number of female start-up entrepreneurs remains low. Across the region, women account for no more than 10-12 per cent of start-up founders. Women may be reluctant to start their own businesses owing to the desire to avoid risk-taking, the lack of available support services, limited exposure to the business world and a lack of access to capital. The shortage of women working in technology is also concerning given the pervasiveness of digital violence in Western Balkan and Eastern European countries. While governments do not keep official statistics, studies attest to the pervasiveness of digital violence among girls and women in all walks of life, with incidents of violence likely increasing in the wake of the COVID-19 pandemic. While all eight countries profiled are signatories to the Budapest Convention on Cyber Crime, none has developed adequate mechanisms for redress or legal frameworks to combat online violence.

Without greater involvement of girls and women in technology, the kinds of products, services and platforms being created will not address the needs of half the population. Throughout the Western Balkan and Eastern European region, technology is being used to promote gender equality, such as in mobile applications to aid survivors of domestic violence or virtual reality tools to train law enforcement on gender-sensitive codes of conduct. Women's involvement is critical both to recognizing these problems in the first place and to addressing them in a responsible manner.

While there is a long way to go, digital divides in the Western Balkan and Eastern Partnership counties are slowly changing. Whereas families and educators may have discouraged girls from pursuing STEM in the past, there is increasing recognition of new technologies as lucrative career paths. In the countries profiled, ICT careers pay between two to eight times higher than the average national wage. Gaps in female participation in technology studies and employment continue to close as more women are attracted to the prospect of better salaries at secure, yet flexible, companies. Economic instability brought about by the COVID-19 pandemic will only increase the attractiveness of the technological field. Now is the time to take bold steps to ensure that girls and young women enjoy the full fruits of the digital revolution.

1 Introduction

Digital technology has never been more integral to people's lives. The COVID-19 pandemic has accelerated this trend, with many industries – from employment to education, and from banking to health services – switching to online formats. During lockdowns and social distancing, online ordering became a means of procuring essentials such as food and medicines. Digital technology has become a lifeline for millions around the world, as well as a critical tool for coping with the crisis and its aftermath.

While it is unknown how long the COVID-19 pandemic will last, what is sure is that it has permanently altered perceptions of what can be done in a digital format. In many industries, the switch to digital will remain a long-term – if not permanent – cost-reduction and time-saving measure. At the same time, the pandemic is exposing digital divides, highlighting the damaging implications of exclusion from the digital world.

Never has it been more vital to examine the role of women and girls who are using, studying and working in digital technology. Around the world, women are under-represented in the ICT employment sector. This trend begins early on, with a gender gap in STEM education, which translates to fewer girls and women pursuing careers related to science and technology. Less exposure to STEM correlates with diminished technological literacy overall.

Furthermore, over 90 per cent of jobs worldwide already have some digital component and many will soon require sophisticated digital skills.[1] Around the world, science and technology are the fastest growing industries and have significantly higher wages.[2] Digital technology professionals in Europe are also relatively unaffected by unemployment.[3] According to research by the European Institute for Gender Equality (EIGE), narrowing the gender gap in STEM education could create up to 1.2 million more jobs and increase long-term gross domestic product (GDP) by up to EUR 820 billion by 2050.[4] While demand for technology professionals is growing, there is a shortage of workers to support those industries.

Analysis of gender and ICT is also critical in a world where every aspect of people's lives is shaped by technology. Unless the involvement of girls and women in technology increases, the kinds of products, services and platforms that are being created will not address the needs of half the population, such as applications or platforms that do not sufficiently address privacy concerns or that expose sensitive information, thereby making women vulnerable to harassment or violence. The result is a "vicious cycle", in which "gender inequality leads to digital inequality, which further entrenches gender inequality."[5]

This report focuses on women, girls and ICT in eight Eastern European countries: five Balkan States **(Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia)** and three Eastern Partnership countries **(Ukraine, Georgia and Moldova).** These countries were selected because they are Member States of the ITU Regional Office for Europe that were

1 https://plan-international.org/education/bridging-the-digital-divide

2 European Parliament, 2015, "Encouraging STEM studies for the labour market", available at https://www.europarl.europa.eu/RegData/etudes/STUD/2015/542199/IPOL_STU(2015)542199_EN.pdf

3 Ibid.

4 Helena Morais Maceira, EIGE, 2017, "Economic benefits of gender equality in the EU", Intereconomics vol. 52, available at https://www.intereconomics.eu/contents/year/2017/number/3/article/economic-benefits-of-gender-equality-in-the-eu.html#:~:text=The%20study%20further%20shows%20that,a%20lower%20gender%20pay%20gap

5 Melinda Gates, 2020, "The pandemic's toll on women", Foreign Affairs, available at https://www.foreignaffairs.com/articles/world/2020-07-15/melinda-gates-pandemics-toll-women#LI

considered for potential assistance. While they range in size – at 42 million inhabitants, Ukraine is the eighth largest country in Europe, while Montenegro is one of the smallest, with a population of 622 000 – they have many characteristics in common.

All eight countries have a relatively high degree of access and connectivity, yet the divide in digital skills exacerbates existing societal chasms. Furthermore, large gender gaps in participation in the ICT industry has an impact on national and regional economies. Without targeted action, gender gaps will only be exacerbated in the wake of the COVID-19 pandemic.

Each of these eight countries is also a signatory or participant in relevant international frameworks, including the Beijing +25 Political Declaration, the 2030 Agenda for Sustainable Development with its Sustainable Development Goals (SDG), and the Generation Equality campaign, created to accelerate gender equality actions and to mark the 25th anniversary of the Beijing Declaration and Platform for Action. Furthermore, increasing the involvement of girls and women in digital technology responds to multiple SDGs, including Goal 4 on quality education, Goal 5 on gender equality, Goal 8 on decent work and economic growth and Goal 10 on reduced inequalities.

Relevant regional frameworks include the Digital Agenda for the Western Balkans, the Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence (the Istanbul Convention) and regional communities such as the European Network of Women in Digital. In 2019, the European Union launched the EU4Digital initiative to extend the benefits of its digital single market to Eastern Partnership States, including Georgia, Ukraine and Moldova.[6] The initiative aims to support the reduction of roaming tariffs and encourage the development of high-speed broadband, ICT research and innovation, and digital skills, among other priority areas. It includes a gender-based impact analysis and strives for gender equal participation in all initiative activities.[7] In the Western Balkans, the 2019 Digital Summit recognized the importance of digital skills in closing gender gaps and boosting employability.[8]

To make good on these initiatives, it is critical to examine barriers and enablers to girls' and women's participation in studying science and technology and working in ICT-related fields, as well as digital literacy and access. The report contains three main sections: the first section examines gender and acquisition of digital skills, with emphasis on girls and young women in formal and informal education, including a focus on technology access as a prerequisite for gaining digital skills; the second section looks at gender equality in the ICT industry, including both established companies and start-up ecosystems; and the third section examines digital violence against women, including the use of technology itself to fight both online and offline violence. Emphasis is placed on the root causes of gendered digital divides, as well as on recommendations and best practices for addressing those gaps at national, regional and international levels.

The report takes into account the fact that norms are changing quickly and that the post-COVID-19 world may be significantly different. While the COVID-19 pandemic may exacerbate existing social and gender inequities, it also has the potential to reshape the world order. With the right policies in place, the social and economic disruption can serve as a catalyst,

6 https://eufordigital.eu/

7 European Union, "Action document for support to the implementation of the EU4Digital initiative in the Eastern Partnership region", available at https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/eni_2017_040574_eu4digital.pdf

8 Western Balkans Digital Summit 2019, Belgrade, "Concluding statement", available at https://www.rcc.int/download/docs/Digital%20Summit%20Conclusions_03.04.2019.pdf/254d81597c8cc9f0dd4edcc4a60390df.pdf

transforming women and girls' involvement in the global technology revolution that is already underway.

2 Methodology

This report uses primary and secondary research, combining qualitative and quantitative techniques. Building on preliminary desk research, it includes qualitative analysis of information from the United Nations, governments, academia, non-governmental organizations (NGOs) and the private sector. This has been supplemented by interviews with key players in gender equality, STEM education, technology companies and the entrepreneurial and start-up ecosystem from the eight countries profiled (see list of interviews in Annex). The quantitative analysis is based on databases managed by ITU and the World Bank, in addition to other national and international databases.

A strategic decision was made to structure the content of the report thematically. As similar barriers, challenges and opportunities arise in each country as the digital revolution "flattens" the world, addressing issues thematically allows for easier comparisons and learning. Furthermore, as the first modern-day global pandemic, COVID-19 cannot be addressed solely at national level. As such, we include examples of good practices at country, regional and international levels. For readers who want an overview of gender and ICT in a specific country, national snapshots are included in the Annex.

There were a few notable challenges in compiling this report, in particular the lack of sufficient, comparable, gender-disaggregated data, which made it difficult to analyse digital divides across countries. Definitions of key terms and concepts may not be standardized or may offer a misleading picture; for example, does digital access refer simply to "ownership" of a digital device or the ability to use that device regularly? How useful is the concept of access if broadband is slow or devices are old?

Similarly, data on "women working in ICT" does not distinguish between those with or without technical education. Many core roles within technology companies, such as human resources, accounting and marketing – which are often female dominated – do not require technical skills. In **Moldova**, postal carriers are defined as ICT professionals, whereas in **Albania**, ICT includes call centre employees in low-paid, low-skilled positions occupied primarily by women.

Furthermore, the concept of what constitutes STEM is not standardized. Some commonly accepted definitions of STEM include social and behavioural sciences, such as psychology, economics, sociology and political science.[9] While there is a relatively high number of female STEM graduates in the countries profiled in this report, the number of women and girls who are specifically studying and working in engineering and technology-related fields is significantly smaller. Without clear and consistent definitions, it is difficult to evaluate the true state of girls, women and ICT.

[9] This is a broad and widely accepted definition used by the United States National Science Foundation.

3 Gender and ICT skills

> *"Digital literacy should be the fourth pillar of education, alongside reading, writing and arithmetic."*
>
> - *Government of the United Kingdom, sponsors of the 21st Century Schools education programme in the Western Balkans*

The inclusion of women and girls in STEM from early to higher education has been recognized as "the best means of ensuring their ability to engage in and benefit from the growing demand for employment with a high technological component."[10] However, only one third of graduates from STEM programmes in tertiary education in Europe are female, with only a modest increase from 32.4 to 34.3 per cent between 2009 and 2013, and 2014 and 2018.[11] As emphasized in the progress report issued following the Economic Commission for Europe Beijing+25 Regional Review meeting, "persistent occupational segregation is addressed primarily by initiatives to eradicate educational segregation, particularly the greater inclusion of women and girls in STEM".[12] Preparing girls and young women to enter technical fields through digital literacy and skill-building, with an emphasis on critical thinking and problem solving, must therefore be accelerated.

This section explores challenges and opportunities for cultivating digital skills and competencies within educational systems in the eight countries profiled. It includes an assessment of digital access as a prerequisite to fully benefiting from connectivity and the Internet. The analysis is conducted in the context of the COVID-19 pandemic as an historical force that is accelerating a digital revolution in formal and informal education settings.

3.1 COVID-19 digital acceleration

The COVID-19 pandemic has the potential to change the course of digital education and equalize the involvement of women and girls in technology. While in-person learning in physical classrooms will resume once the pandemic subsides, the new norms being created and the greater integration of technology in schools can transform education systems in the long term. Although the twin health and economic crises that are currently unfolding are widening the gaps between marginalized groups, with proper access to broadband and the Internet digital learning has the potential to reach many more girls and women and to decrease the gaps between rich and poor.

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10 Beijing +25 Regional Review Meeting, Economic Commission for Europe, 2019, "Regional review of progress: Regional synthesis", available at http://www.unece.org/fileadmin/DAM/RCM_Website/ECE_AC.28_2019_3-e_rev.pdf

11 UN Women, 2020, "Keep the promise, accelerate the change: Taking stock of gender equality in Europe and Central Asia 25 years after Beijing", available at https://eca.unwomen.org/en/digital-library/publications/2020/10/keep-the-promise-accelerate-the-change

12 Beijing +25 Regional Review Meeting, Economic Commission for Europe, 2019, "Regional review of progress: Regional synthesis", available at http://www.unece.org/fileadmin/DAM/RCM_Website/ECE_AC.28_2019_3-e_rev.pdf

Transition to online learning in school

The COVID-19 pandemic represents the largest disruption of educational systems in modern history, affecting 94 per cent of the world's student population.[13] The countries in this study are no exception; during lockdowns in the spring of 2020, COVID-19-related closures affected approximately 6 million students in **Ukraine**, 1 221 000 in **Serbia**, 815 000 in **Georgia**, 653 000 in **Albania**, 586 000 in **Moldova**, 523 000 in **Bosnia and Herzegovina**, 360 000 in **North Macedonia** and 136 000 in **Montenegro**, where entire educational systems were shut across the country.[14]

At that time, all the countries in this study pivoted to distance learning, broadcasting classes mainly online, as well as through national television stations. This transition occurred with various degrees of success both within and between countries, depending on the availability of computers/hardware in homes, the number of devices available (as families with multiple children often needed to share), the condition of hardware (older computers made it slow/difficult to access lessons), broadband costs and speeds, comfort with digital tools on the part of students and teachers and the availability of parents to supervise younger children's sessions.

Table 1: Remote learning methods during COVID-19

Country	Online	Television broadcast	Additional distribution channels
Albania[15]	Lessons delivered through online platforms	Lessons recorded and broadcast on national TV	
Bosnia and Herzegovina[16]	Lessons delivered through online platforms	Lessons recorded and broadcast on national TV	Radio networks and Viber application groups
Serbia[17]	Platform for online classes developed and lessons delivered through online platforms	Lessons televised every day on two national TV channels	Free applications for carrying out and submitting schoolwork were also developed for mobile phone and tablet

13 United Nations, 2020, "Policy brief: Education during COVID-19 and beyond", available at https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

14 United Nations Educational, Scientific and Cultural Organization (UNESCO), "Education: From disruption to recovery", available at https://en.unesco.org/covid19/educationresponse

15 Education International, 2020, "Albania: Education union uses technology to reduce impact of COVID-19", available at https://www.ei-ie.org/en/detail/16687/albania-education-union-uses-technology-to-reduce-impact-of-covid-19

16 United Nations Bosnia and Herzegovina, 2020, "Rapid situation and needs assessment: Education in BiH during COVID-19", available at https://bosniaherzegovina.un.org/en/95314-rapid-situation-and-needs-assessment-education-bih-during-covid-19

17 China CEE Institute, 2020, "Serbia social briefing: Serbian society and education system response to COVID-19", available at https://china-cee.eu/2020/06/04/serbia-social-briefing-serbian-society-and-education-system-response-to-covid-19/

Table 1: Remote learning methods during COVID-19 (continued)

Country	Online	Television broadcast	Additional distribution channels
Montenegro[18]	#UciDoma (learn from home) distance learning, including over 300 online courses; dedicated YouTube channel and website	Televised lessons on a number of subjects on three national TV channels	Mobile application
North Macedonia[19]	Online lessons tailored to different grades and subjects; YouTube-based e-classroom created as a one-stop-shop for educational content for children aged 6 to 14 years (United Nations Children's Fund (UNICEF))	"TV-Classroom" provided educational content for preschoolers	
Ukraine[20]	Lessons posted on official Facebook page and YouTube channel of the Ministry of Education and Science of Ukraine	11 subjects taught remotely on 11 different TV channels; broadcast lessons for schoolchildren from fifth to eleventh grade	
Georgia[21]	Virtual classrooms for all classes and relevant subjects were created on Microsoft Teams; video and text instructions to support public schools were developed	Georgian Public Broadcasting began holding live lessons for school students in three languages – Georgian, Armenian and Azerbaijani	
Moldova[22]	Online library of video lessons created using a combination of international resources, such as Zoom and Google, and local resources, such as Studii.md	Lessons recorded and broadcast on national TV	

18 United Nations Sustainable Development Group, 2020, "Supporting the education system to cope with COVID-19 in Montenegro", available at https://unsdg.un.org/latest/stories/supporting-education-system-cope-covid-19-montenegro

19 Gjorgjioska M. Adela, 2020, "North Macedonia social briefing: Covid-19: Disruptions and improvised solutions in a fractured educational system", China CEE Institute Weekly Briefing vol. 30, No. 3, available at https://china-cee.eu/wp-content/uploads/2020/07/2020s06_North-Macedonia.pdf

20 Veronika Selega, 2020, "Ukrainian educators find multimedia solution to coronavirus school closures", Atlantic Council, available at https://www.atlanticcouncil.org/blogs/ukrainealert/ukrainian-educators-find-multimedia-solution-to-coronavirus-school-closures/

21 Agenda.ge, 2020, "Schools to remain closed until September 1 in Georgia", available at https://agenda.ge/en/news/2020/1283

22 United Nations Moldova, 2020, "Education and COVID-19 in the Republic of Moldova", available at https://www.unicef.org/moldova/media/4231/file/Working%20Paper%20Education%20and%20COVID-19%20in%20the%20Republic%20of%20Moldova_FINAL_English%20version.pdf%20.pdf

Countries with existing digital platforms in place had an easier time making the switch. For example, in Serbia a system called "E-diary", implemented in 2018 to provide digital records of students' successes and conduct, facilitated the quick adaptation of distance learning in the education system. Those without proper online platforms often used alternatives from private companies, such as Google Classroom and Microsoft Teams.

The abrupt transition to digital education highlighted the dearth of research addressing the effectiveness of online learning overall, and specifically from a gender perspective. Whereas numerous studies have examined gender differences in the classroom in areas such as learning styles and interactions between teachers and male versus female students, a paucity of information exists regarding whether these gender divides are also reflected in digital environments. As online or hybrid learning models may persist long after the COVID-19 recovery period, more research is necessary to identify gender differences in online learning.

In the meantime, country reports and interviews demonstrate how remote learning poses organizational and time-management challenges for girls and women, who may take on greater domestic or caregiving responsibilities while at home. In **Ukraine**, girls reported feeling more pressure over online learning because they "study more and take school more seriously."[23] At the beginning of the pandemic in **Moldova**, 40 per cent of female students reported having limited or no free time or time for rest, compared with 29 per cent of boys.[24]

In after-school settings, however, it was noted that remote learning allowed more girls to participate more actively. Rather than running programmes for small groups, online formats allowed many more girls to take part in educational webinars. Furthermore, the anonymity of digital platforms encouraged girls to interact through chat functions, when they might have been less willing to participate in person.[25]

Access to and competence with digital devices by gender

A basic requirement for distance learning is access to a proper physical device and reliable Internet access. Many countries in this study have a high degree of digital access, particularly among young people, and only minor differences between male and female Internet usage. In fact, rather than gender digital divides, larger differences can be found between users in urban versus rural areas, in addition to lower access among underserved populations, including ethnic minorities, persons with disabilities and persons with low socio-economic status.

According to a 2018 study conducted by the Organization for Economic Cooperation and Development (OECD) as part of its Programme for International Student Assessment (PISA), the majority of students in the countries profiled in this report have Internet access at home. In fact, over 90 per cent of (secondary) school students in **North Macedonia**, **Serbia**, **Ukraine**, **Bosnia and Herzegovina** and **Montenegro** have access to the Internet.[26] In **Georgia** and **Moldova**, while students from advantaged schools almost uniformly have access, about 80 per cent of students

23 Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

24 United Nations Moldova, 2020, "Education and COVID-19 in the Republic of Moldova", available at https://www.unicef.org/moldova/media/4231/file/Working%20Paper%20Education%20and%20COVID-19%20in%20the%20Republic%20of%20Moldova_FINAL_English%20version.pdf%20.pdf

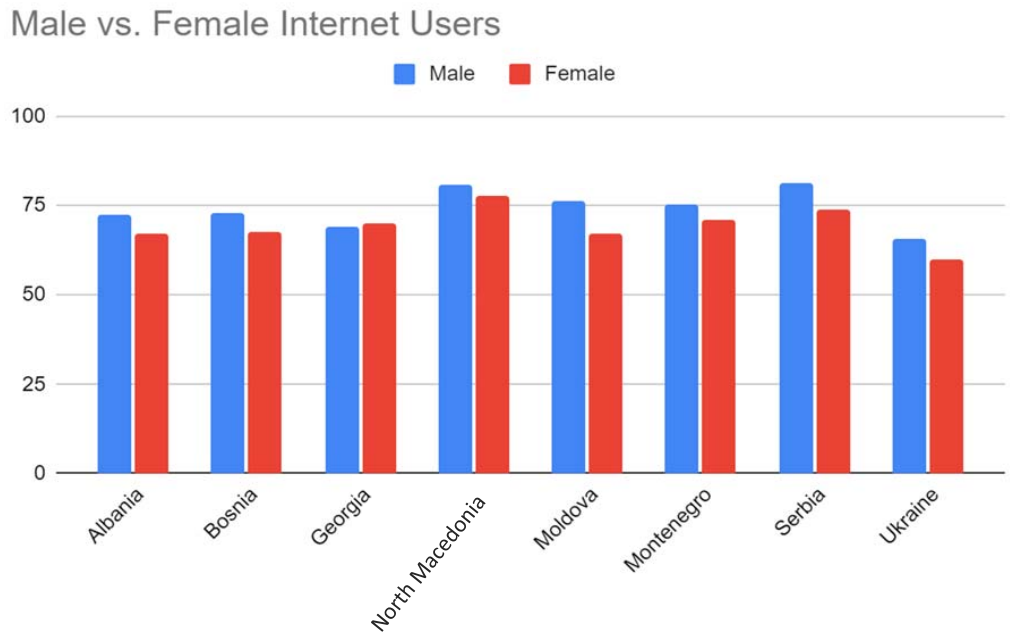
25 Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

26 OECD, 2020, "Learning remotely when schools close: How well are students and schools prepared? Insights from PISA", available at https://www.oecd.org/coronavirus/policy-responses/learning-remotely-when-schools-close-how-well-are-students-and-schools-prepared-insights-from-pisa-3bfda1f7/

attending less advantaged schools reported having access.[27] The gap between students was the greatest in **Albania**, where only 60-70 per cent of students from disadvantaged backgrounds reported having access, compared with over 90 per cent of children who attend advantaged schools. However, none of the statistics for student access are broken down by gender, and the kinds of devices used by students to access the Internet are not specified.

In terms of Internet use in the general population, gender gaps are relatively small, ranging between a little over 1 per cent in Georgia to around 8 per cent in Serbia.

Figure 1: Male and female Internet users



Source: ITU Database, 2019

In the wake of the pandemic, notable efforts were made by the private and public sectors to improve digital access. In **Albania**, for example, some Internet providers cut their fees in half.[28] In **Bosnia and Herzegovina**, donation points and distribution centres were established to provide laptops and tablets for underprivileged students.[29] Such time-bound and scattershot efforts are not enough to bring about long-term change, however.

Furthermore, available figures may obscure important differences, as digital divides persist regardless of a given population's level of access to technologies. Basic digital access and literacy are "necessary but not sufficient conditions for women [and girls] to meaningfully use

[27] According to the study, a socio-economically disadvantaged school is a school that has a socio-economic profile (i.e. the average socio-economic status of the students in the school) in the bottom quarter of the PISA index of economic, social and cultural status among schools in the relevant country/economy.

[28] Education International, 2020, "Albania: Education union uses technology to reduce impact of COVID-19", available at https://www.ei-ie.org/en/detail/16687/albania-education-union-uses-technology-to-reduce-impact-of-covid-19

[29] China CEE Institute, 2020, "Bosnia Herzegovina social briefing: Impact of COVID-19 lockdown measures on education and culture during March and April", available at https://china-cee.eu/2020/05/25/bosnia-herzegovina-social-briefing-impact-of-covid-19-lockdown-measures-on-education-and-culture-during-march-and-april/

ICTs."[30] More meaningful data could include: 1) household connectivity, use and access by male and female members within households; 2) gendered access to essential online services and transactions; 3) gender skill gaps, which may increase as ICT skills become more sophisticated. Each of these should be compared across different geographical locations and among various socio-economic population segments.

For example, decisions made regarding who uses which devices – and when – often have a gender component. Evidence from middle-income countries shows that girls receive access to digital technology at a later age than boys, and their use of digital technology is more often curtailed by their parents.[31] In **Albania,** for example, women's and girls' mobile phone usage is commonly controlled by male family members. Furthermore, Albanian parents may be stricter with girls than boys regarding many Internet-related activities, such as using a webcam, entering a chat room and watching online video clips.[32] In **Ukraine**, Roma women reported difficulties supporting online learning for their children owing to a lack of both technical capacity and access to connected digital devices.[33] During quarantine periods in **Georgia**, the higher earner in a family – most often the father – commonly used his own computer for work, while mothers were expected to lend their devices to children for their studies.[34]

COVID-19 restrictions have also revealed limitations in online service provision caused by a lack of suitable devices at household level in both urban and rural areas. A UN Women project to train **Georgian** women aged 18-35 years in digital skills found that the hours of their sessions needed to be changed to later in the day so that women could have access to a suitable device after their children finished their morning schooling.[35] Similarly, in **Ukraine**, a group running STEM workshops for girls held their programming on weekends, when parents were not working, so that girls could use their parents' laptops.[36]

Furthermore, many countries with minimal gaps in digital access demonstrate gender skill gaps. In **Serbia**, for example, while women and men use the Internet equally for everyday tasks (taking an online course, paying bills, etc.), men tend to have more advanced digital skills.[37] In **Georgia**, gender differences can be seen in the way men and women use the Internet, with women far more interested in leisure pursuits, such as social networking and reading online news, while men use the Internet for more practical purposes, such as Internet banking or downloading software.[38]

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30 EQUALS, 2019, "Taking stock: Data and evidence on gender equality in digital access, skills and leadership", available at http://itu.int/go/EqualsResearch2019

31 ITU, 2020, "Guidelines for parents and educators on child online protection", available at https://www.itu-cop-guidelines.com/parentsandeducators

32 UNICEF, 2020, "One click away: Children's experience of Internet use in Albania", available at https://www.unicef.org/albania/media/2486/file/one%20click.pdf

33 UN Women, 2020, "Summary report: Rapid gender assessment of the situation and needs of women in the context of COVID-19 in Ukraine", available at https://www2.unwomen.org/-/media/field%20office%20eca/attachments/publications/2020/05/rga%20summary%20report_eng_web-min.pdf?la=en&vs=4314

34 Ana Pashalishvlli, UN Women Georgia, in conversation with the author

35 Ibid.

36 Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

37 Statistical Office of Republic of Serbia, 2020, "Usage of information and communication technologies in the Republic of Serbia, 2020: Households/individuals, enterprises", available at https://publikacije.stat.gov.rs/G2020/PdfE/G202016015.pdf

38 National Statistics Office of Georgia, "Information and Communication Technologies Usage in Households", available at https://www.geostat.ge/en/modules/categories/106/information-and-communication-technologies-usage-in-households

Overall, digital gender gaps are wider in rural areas and among communities that face intersectional disadvantages, including poverty, lower education, lack of employment or informal employment. This is due to a combination of cost, lack of digital skills and lack of broadband/mobile signals in some rural or mountainous areas. This issue is particularly striking in **Albania**, where broadband costs remain high and there is often no Internet access in remote areas.[39]

The Digital Agenda for the Western Balkans was launched in 2018 to address some of these challenges and has thus far made progress on reducing the cost of mobile data through the Western Balkans Roaming Agreement. However, in the context of the COVID-19 pandemic and its aftermath, more research is necessary to determine how digital tools are being used and how access to areas such as online financial and health services, education and training, and employment leads to empowerment or disempowerment.

Digital competence for teachers

In the spring of 2020, schools and teachers worldwide were thrust into an unprecedented situation and forced to modify their curricula almost overnight. Even though online interactions differ from in-person behaviour, teachers had little time to adapt their lesson plans. The transition to online learning during the COVID-19 pandemic highlights the importance of "digital competence" for teachers, i.e. having the knowledge, skills, attitudes, abilities and strategies necessary for the effective use of ICT and digital media.

Despite the importance of digital skills in the current and post-pandemic world, it is estimated that only 20-25 per cent of students in Europe are taught by digitally confident teachers.[40] Some teachers struggle with the digital platforms necessary to communicate with students or parents, and they may not have the knowledge or confidence to pass on digital skills to their pupils. Whether or not they focus on STEM-related subjects, teachers who are knowledgeable and confident about using technology in their classrooms serve as role models.

Digital competence in the classroom is a gender issue, as the majority of schoolteachers are female. Women remain overrepresented as teachers in primary and secondary education in the countries profiled, and indeed around the world (in university/tertiary settings, the gender balance is more equal).[41] Research has, however, produced mixed findings regarding whether gender plays a role in digital competence and effective technology use in the classroom.[42] In countries such as **Moldova**, gender may be compounded by the age of teachers, since one in four mathematics/science teachers in villages is elderly and may be less comfortable with modern technology.[43] As online and remote learning becomes an integral component of

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39 Education International, 2020, "Albania: Education union uses technology to reduce impact of COVID-19", available at https://www.ei-ie.org/en/detail/16687/albania-education-union-uses-technology-to-reduce-impact-of-covid-19

40 EIGE, 2017, "Economic benefits of gender equality in the EU: How gender equality in STEM education leads to economic growth", available at https://eige.europa.eu/publications/economic-benefits-gender-equality-eu-how-gender-equality-stem-education-leads-economic-growth

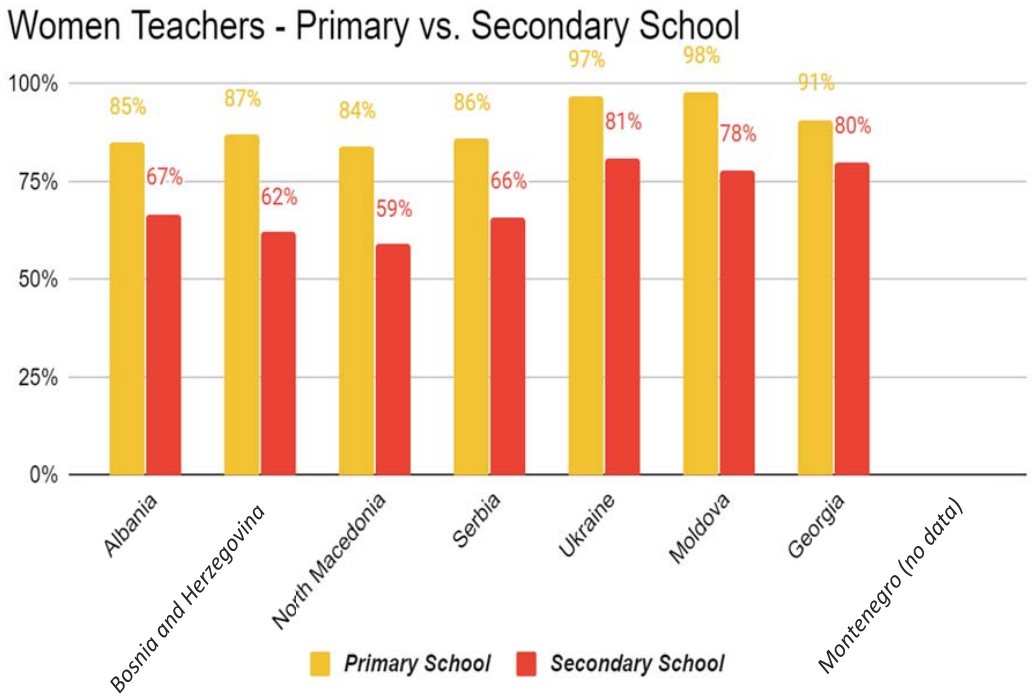
41 Eurostat Newsrelease, 2016, "Women teachers largely over-represented in primary education in the EU", available at https://ec.europa.eu/eurostat/documents/2995521/7672738/3-04102016-BP-EN.pdf/9f0d2d04-211a-487d-87c3-0a5f7d6b22ce

42 Sonia Casillas Martín et al, 2017, "Evaluation of digital competence from a gender perspective", available at https://www.researchgate.net/publication/323727448_Evaluation_of_digital_competence_from_a_gender_perspective

43 Rodica Nicoară and Maria Vremiș, 2019, "Femeile și bărbații în sectorul Tehnologiei informației și comunicațiilor (TIC)", available at https://statistica.gov.md/public/files/evenimente/2019/TIC/Studiu_analitic_Femei_Barbati_TIC.pdf

childhood education, more work must be done to equip teachers with the skills and tools to ensure optimal use of technology in online and offline classrooms.

Figure 2: Women teachers in primary and secondary schools



Source: The World Bank, 2020, "Primary education, teachers (% female)", available at https://data.worldbank.org/indicator/SE.PRM.TCHR.FE.ZS

Among the countries profiled, **Serbia** invests the most in building digital literacy for teachers. It has developed a complete framework to map pedagogical digital competences and define the skills, goals and expected outcomes of digital training.[44] Teachers can use the document to assess their own skills and practices and to identify next steps for their professional development. Furthermore, digitally competent teachers have an easier time assessing students' digital proficiency.

Other Balkan countries also provide technology training for teachers. In **Montenegro**, for example, continuing professional development in digital education is part of a national initiative to promote digitization in society. **North Macedonia** provides training for primary and secondary school teachers focused on basic ICT skills, as well as integration of software solutions in interactive teaching. According to one survey, however, around half of Macedonian teachers reported that they needed additional training to enable them to adequately integrate ICT in their classrooms.[45] The COVID-19 pandemic also served as a catalyst for other countries to begin assisting teachers with distance education. Across districts in **Georgia,** for instance,

[44] Republic of Serbia, 2017, "Digital Competence Framework: Teacher for a digital age", available at http://socijalnoukljucivanje.gov.rs/rs/okvir-digitalnih-kompetencija-nastavnik-za-digitalno-doba/

[45] Vera Stojanovska and Aneta Barakoska, 2016, "Training of the teachers for the application of ICT in the teaching process", available at http://www.irisro.org/educonf2016may/14StojanovskaVera-BarakoskaAneta.pdf

virtual consulting spaces were established online and through social media to answer teachers' questions about distance learning.[46]

3.2 Cultivating long-term digital skills

The technology paradox: Fostering early interest among young women

The COVID-19 crisis is disrupting the lives of young people in never-before-seen ways. Jobs lost during the pandemic may never return, established industries are changing rapidly and in unplanned ways, and young people may need to rethink their future career paths. Transferable skills, such as problem solving and analytical thinking, are more critical than ever for young people who are training for jobs that do not yet exist.

The high degree of digital access across countries in this survey means that girls are exposed to technology such as mobile phones, video games and social media at a young age. While technology jobs are plentiful and offer high salaries, they remain less attractive to girls and young women when choosing their careers. Efforts to effectively addressing the digital gender gap must therefore begin early. Research in Eastern and Western European countries demonstrates a small window of opportunity in which pre-teen and adolescent girls are open to learning about science and technology, generally between the ages of 11-12 and 15-16 years.[47] Past that age, interest has been shown to drop off significantly, with limited recovery. By the time girls reach mid-adolescence, even many of those who excelled in STEM-related subjects are likely to drop them.

Early interventions are challenging in contexts where cultural norms and biases dictate boys' and girls' activities, however. Throughout their lifetime, many girls and women battle stereotypes that dissuade them from pursuing fields related to science and technology. In **Moldova**, almost one third of female secondary school students who reported liking computer science in school believed that programming is "not an appropriate domain for girls". Among girls living in rural areas, that number was even higher, at 39 per cent.[48] In Georgia, a traditional saying labels girls who are good at mathematics and science as "thinking like a boy."[49] In **Bosnia and Herzegovina**, 33 per cent of girls report that their families would not encourage them to take up university studies in a STEM field. In **Ukraine**, even parents who encourage girls to obtain good grades in all subjects – including STEM – may not be supportive when it comes to girls choosing a science or technology career. Similarly, teachers may not take girls' ambitions seriously.[50] Emphasis on STEM in primary and secondary schools is critical, given the importance of academic preparation before higher education in increasing the enrolment and retention of STEM university students.[51]

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46 Ministry of Education, Science, Culture and Sport of Georgia, 2020, "Ministry of Education, Science, Culture and Sport of Georgia to strengthen distance learning methods", available at http://mes.gov.ge/content.php?lang=eng&id=10271

47 Andrew Trotman, 2017, "Why don't European girls like science or technology?", Microsoft, available at https://news.microsoft.com/europe/features/dont-european-girls-like-science-technology/

48 Aurelia Bradeţchi et al, 2014, "Motivations and barriers for girls and women in STEM and ICT domains", Magenta Consulting, available at https://www2.unwomen.org/-/media/field%20office%20moldova/attachments/publications/2020/en%20ggitraport%20final240820.pdf?la=en&vs=705

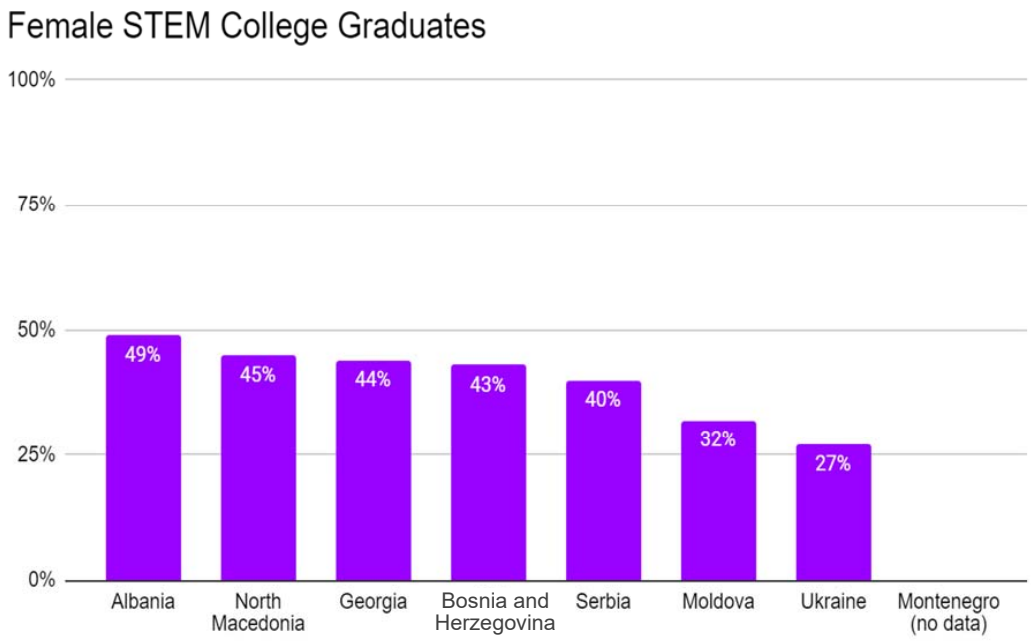
49 Nino Nanitashvili, Women Techmakers Tbilisi, Georgia, in conversation with the author

50 Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

51 Julie J. Park et al, 2019, "Student-faculty interaction and discrimination from faculty in STEM: The link with retention", Research in Higher Education vol. 61, available at https://link.springer.com/article/10.1007%2Fs11162-019-09564-w

As demonstrated in the chart below, the eight countries profiled have a high share of women who graduate from university with STEM-related degrees. In fact, in five of the eight countries, women comprise more than 40 per cent of university graduates in such fields. Yet the definition of STEM is unclear or inconsistent across countries. In the Balkans, for example, although women are highly represented in science and research, significantly fewer women work in fields related to technology and innovation;[52] a scientist working in a laboratory will have a very different career path to a woman who studies electrical engineering or artificial intelligence, for example. While more research must be done to understand these statistics, there is a clear gap between the number of female STEM graduates and the numbers of women who ultimately pursue technology careers. Understanding and fixing this leaky pipeline in the Western Balkans and in Eastern Partnership countries is critical to recruiting more women into technology fields.

Figure 3: Female graduates from STEM-related courses (%)



Source: The World Bank, 2019, "There are fewer female than male STEM graduates in 107 of 114 economies", available at https://blogs.worldbank.org/opendata/there-are-fewer-female-male-stem-graduates-107-114-economies

Perceived abilities and self-confidence

Given the stereotypes that girls encounter, it is no surprise that their self-confidence is affected. According to cross-country surveys, girls may already have lower confidence in their digital skills than boys by age 15; for example, boys are more likely to solve problems with digital devices on their own or feel more comfortable than girls in using digital devices with which they are less familiar.[53]

[52] Generation Equality, 2020, "Future of equality: She talks #1 report", available at https://www.wecf.org/wp-content/uploads/2020/10/09102020_SheTalksI-_Future-of-Equality_-Report.pdf

[53] EIGE, 2018, "Women and men in ICT: A chance for better work life-balance – Research note", available at https://eige.europa.eu/publications/women-and-men-ict-chance-better-work-life-balance-research-note

Even in instances where girls score higher than boys in STEM-related skills, their "self-efficacy" or perception of their abilities tends to be lower than that of boys.[54] Girls may be more critical of themselves and hold themselves to higher standards. Where girls are good at both STEM and humanities (i.e. non-STEM subjects), they may choose humanities because they believe it will be easier for them to achieve higher grades.[55]

Research in **Bosnia and Herzegovina** shows that both male and female students believe that men are better programmers, mechanical engineers, astronomers, civil engineers and electrical engineers.[56] A self-evaluation conducted among secondary school students in **North Macedonia** showed that, while girls and boys believed that they were equally competent in mathematics and science, boys evaluated themselves much higher than girls in information technology (IT).[57] In a poll of **Ukrainian** women aged 15-24 years, 23 per cent felt that confidence was stopping women from pursuing a career in technology, while 10 per cent thought the technology field was only for men.[58] Furthermore, 35 per cent felt that dispelling harmful gender stereotypes was key to motivating women to choose a technology-related career.[59]

In **Georgia**, **Albania** and **Moldova**, lack of competence in English – the main language of ICT – was noted as a barrier to studying programming and related fields. Georgian women, for instance, may have less time and money to learn English or to translate existing information and training documents into local languages. One solution was initiated by a local Georgian non-profit, Educare, which translates educational materials from sites such as Code.org and Khan Academy into local languages.

Integration of digital skills into education systems

For many girls and boys, school is the first place that they encounter STEM. While schools are critical in developing STEM skills, education systems vary in their emphasis on digital competence. For example, the three former Soviet bloc countries profiled in this report retain a legacy of emphasis on mathematics and science, yet teaching styles are often theoretical and out of date, with huge gaps between school curricula and the skills necessary for technology-related careers. To meet international standards, more and more countries are adopting European-wide frameworks, such as the European Commission's Digital Competence Framework (DigComp), to identify key skills, including information and data literacy, digital content creation, communication and collaboration, safety and problem solving.[60]

Many governments are also making efforts to overhaul their education systems and integrate twenty-first century skill sets. However, with the exception of **Serbia** and **Ukraine**, the countries

[54] EQUALS, 2019, "I'd blush if I could: Closing gender divides in digital skills through education", available at, https://2b37021f-0f4a-4640-8352-0a3c1b7c2aab.filesusr.com/ugd/04bfff_06ba0716e0604f51a40b4474d4829ba8.pdf

[55] Sofoklis Goulas et al, 2020, "Comparative Advantage and Gender Gap in STEM", Institute for the Study of Labor discussion paper No. 13313, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3620627

[56] UN Women, 2019, "Gender gap in STEM fields and intervention programmes proposal (BiH)", unpublished report

[57] Kristina Hadzi-Vasileva, 2019, "Mapping of gender in ICT sphere in Macedonia", Association for Progessive Communications, available at https://metamorphosis.org.mk/wp-content/uploads/2019/05/Gender-and-IT-Assesement-.pdf

[58] Report Ukraine, "**Опитування**", available at https://ukraine.ureport.in/opinion/2295/

[59] Ibid.

[60] The DigComp framework is divided into five areas: information and data literacy; communication and collaboration; digital content creation; safety; and problem solving. See: https://ec.europa.eu/jrc/en/digcomp

profiled have no or minimal mechanisms to ensure and evaluate whether the curriculum equally benefits boys and girls. Rather, this task falls to outside actors such as NGOs, United Nations agencies and private companies. Across the countries profiled, one recurring theme is the importance of "enrichment education" (i.e. education outside of the formal school system) in addressing the digital gender divide.

In **Serbia**, programming is taught in all primary schools, and informatics and computer science was made compulsory in secondary schools in 2017. Efforts are made to ensure digital literacy, including experimenting with digital textbooks and equipping classrooms with digital equipment and materials.[61] Nearly 1 750 additional schools are in the process of being connected to a free, secure academic Internet network, which includes access to educational content and the ability to block sites with harmful content.

Assessment of individual students' digital competences is the main focus of national tests in lower and upper secondary education in **Serbia**.[62] The number of university technological facilities, IT departments in secondary schools and places for students at technical faculties is also increasing,[63] as the Government aims to increase the number of new skilled IT workers from 1 500 per year to 5 000 per year.[64]

Small-scale and pilot efforts are being made to ensure that girls both participate in and benefit from this new system. The Serbian Plan for Empowerment of Women in ICT 2019-2020 includes training on "programming, project management and digital entrepreneurship" for 150 primary school girls; training for 200 secondary school girls to become peer educators on Internet safety; activities to connect 25 female students at technical faculties with IT companies to provide internships, professional training and mentoring; and "creative workshops" for female secondary school students on applying technology tools, such as virtual reality, robotics and computer-aided design, in fields from music to architecture.[65] While the percentage of women studying ICT in Serbia remains small at 28 per cent, this is 7 percentage points higher than the European Union average of 21 per cent.[66]

North Macedonia has the highest number of recommended hours for ICT as a compulsory separate subject (around 150 hours).[67] ICT instruction begins at the third grade and allows for continuous studying of informatics throughout all four years of secondary education.[68] While the education system includes learning outcomes in the five areas of the DigComp framework, digital skills are not assessed through national tests. Frameworks for building teachers' digital

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61 Republic of Serbia, 2020, "Strategy of digital skills development in the Republic of Serbia for the period 2020 to 2024", available at https://mtt.gov.rs/en/download/Strategy%20of%20Digital%20Skills%20Development%20in%20the%20Republic%20of%20Serbia%20for%20the%20period%202020-2024.pdf

62 Eurydice, European Commission, 2019, "Digital education at school in Europe", available at https://eacea.ec.europa.eu/national-policies/eurydice/content/digital-education-school-europe_en

63 Republic of Serbia, 2020, "Strategy of digital skills development in the Republic of Serbia for the period 2020 to 2024", available at https://mtt.gov.rs/en/download/Strategy%20of%20Digital%20Skills%20Development%20in%20the%20Republic%20of%20Serbia%20for%20the%20period%202020-2024.pdf

64 InterVenture, 2019, "Serbia wants to become the Silicon Valley of the Western Balkans", available at https://www.interventure.info/blog/serbia-wants-to-become-the-silicon-valley-of-the-western-balkans/

65 Republic of Serbia, 2020, **"Програм за оснаживање жена у области информационо-комуникационих технологија за период 2019-2020. године"**, available at https://mtt.gov.rs/download/Program.pdf

66 Republic of Serbia, 2020, "Strategy of digital skills development in the Republic of Serbia for the period 2020 to 2024", available at https://mtt.gov.rs/en/download/Strategy%20of%20Digital%20Skills%20Development%20in%20the%20Republic%20of%20Serbia%20for%20the%20period%202020-2024.pdf

67 Eurydice, European Commission, 2019, "Digital education at school in Europe", available at https://eacea.ec.europa.eu/national-policies/eurydice/content/digital-education-school-europe_en

68 Republic of Macedonia, 2018, "Education Strategy for 2018-2025 and Action Plan", available at http://mrk.mk/wp-content/uploads/2018/10/Strategija-za-obrazovanie-ENG-WEB-1.pdf

competence levels are mandatory, along with a programme to provide computers and wireless access to primary school students and teachers.[69] The national Education Strategy and Action Plan 2018-2025 does not explicitly address the gendered digital divide or provide specific programming for girls, however.

In **Montenegro**, ICT is a compulsory separate subject and follows the five compulsory areas in DigComp. Continuing professional development in digital education is offered for teachers, who receive guidance on assessing digital proficiency in the classroom across all school levels. Digital competence is acknowledged on secondary school certificates, and monitoring/evaluation of digital competences is undertaken on a regular basis. The Montenegrin Education Strategy 2016-2020 makes no reference to gender in ICT or in general, however, and the Strategy for Inclusive Education 2018-2025 focuses only on students with disabilities.

In **Albania**, the digital education strategy appears far more basic. It includes developing school infrastructure by providing high-speed Internet for schools, improving digital communication between schools and regional education units, creating digital materials in the Albanian language and raising awareness about the dangers of the Internet. However, there is a low ratio of devices available per student, Internet access is only available in computer laboratories in many schools, and the amount of digital content in the Albanian language remains low.[70] Digital skills education begins in secondary school rather than primary school, and student competence is not assessed in national tests. While technology is the third most popular choice in vocational education and training (VET), women are significantly under-represented in that area. The Albanian Digital Agenda 2015-2020 does not mention gender equality inside or outside schools.

In 2016, the Ministry of Education and Science in **Ukraine** introduced the ambitious New Ukrainian School concept, a competence-based approach to learning based on DigComp. Recognizing that the old system promoted outdated teaching methods and favoured rote recitation of dry facts over real-world applications, the Government is embarking on a major overhaul, with phases lasting through 2029. Areas of focus include mathematical literacy, digital and technological competence and entrepreneurship in formal primary and secondary education.

An accompanying document sets out the national strategy for the full implementation of the gender component in education, including information on conducting information campaigns, motivating Ukrainian girls and women to choose non-stereotypical STEM careers and ensuring "mastery of professional skills in accordance with personal abilities and interests", without limiting choices to "female" or "male" professions.[71]

Every year, over 150 000 university students graduate in Ukraine, of whom around 40 000 obtain technology-related degrees. Additionally, around 40 000 specialists graduate annually from technology schools. While Ukraine's education system remains strong on mathematics and science, universities also require fundamental reform, as they remain poorly equipped to match education to the current needs of employers in the fast-moving ICT industry.

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69 Intel, 2011, "Macedonia implements first 1:1 technology integration program in the Balkans", available at https://www.intel.eg/content/dam/doc/case-study/learning-series-technology-integration-study.pdf

70 Republic of Albania, 2015, ICT in Education in Albania, available at http://archive.iite.unesco.org/files/news/639224/ENG_Albania_MoE_Bajame_Allmeta.pdf

71 Ukraine, 2020, "**Стратегія упровадження гендерної рівності та недискримінації у сфері освіти «Освіта: гендерний вимір – 2020**»", available at https://mon.gov.ua/storage/app/media/gromadske-obgovorennya/2016/proekt-gendernoyi-strategiyi.doc

"Forget everything you learned in school"

Historically, **Ukraine** places heavy emphasis on mathematics and science in formal schooling. Yet young people report a gap between the "old fashioned" and "highly theoretical" curriculum that they are being taught and the world of innovation that characterizes the forward-looking technology ecosystem. One young woman described studying chemistry with no equipment and not once conducting an experiment. She was told to "forget everything you learned in school" at her first real-world job.[1] This epitomizes the disconnect between the subjects that students are studying and the skills that they actually need to be successful in technology careers.

[1] Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

Like Ukraine, the Government of **Georgia** recognizes the need to reform and upgrade the education system. Within the scope of the "New School" model, plans have been made to refurbish computer classes, equipping them with broadband and WiFi, and to modernize educational resources using, for example, popular children's coding programs such as Minecraft and Scratch. Emphasis will be placed on developing students' critical thinking and mathematical and algorithmic skills.[72] However, the Georgian Unified Strategy for Education and Science 2017-2021 does not acknowledge or address gendered digital divides.

In Georgian higher education, traditional university-based bachelor of arts (BA) and master of arts (MA) programmes are considered insufficient to match market needs. Informal and self-education tracks are more highly regarded by leading IT companies. Gaps in IT education are partially addressed through new partnerships between

universities, the Georgian Innovation Authority (GITA) and private organizations. Initiatives such as the San Diego State University campus in Tbilisi and the Kutaisi Technology University project could play a significant role in introducing higher quality standards.

In **Moldova**, traditional curricula lack an emphasis on information technology, resulting in declines in the popularity of STEM courses in schools and fewer students studying STEM at university. Some efforts have been initiated to counter this trend, such as the introduction of educational robotics initiative RoboClub into selected classrooms and libraries. In 2018, through a partnership between Tekwill and the Ministry of Education, optional STEM courses in robotics, entrepreneurship and digital creativity were launched throughout the country. However, these courses remain ad hoc and are not fully integrated into the education system. While Tekwill did make efforts to encourage girls to join their courses, neither the Moldova Education Development Strategy 2014-2020 nor the Strategy for the development of the information technology industry and the ecosystem for digital innovation 2018-2023 acknowledges or addresses gendered digital divides.

Moldova has 18 higher educational institutions that offer IT-related studies or services. Nonetheless, as with other Eastern Partnership countries, teaching methods are often outdated and not practice-oriented. According to a study by the World Bank, "ICT professionals

[72] Ministry of Education, Science, Culture and Sport of Georgia, 2019, "Presentation of the reform for the renewed education system", available at https://mes.gov.ge/content.php?id=8919&lang=eng

complained that teaching materials were too theoretical during the first two years of university. They criticized the curriculum and courses as not being related to the ICT profession, that there was a lack of optional courses, that the laboratories were usually outdated, poorly equipped and with bad Internet connections, and that teachers lacked practical experience and were usually not well trained."[73] Furthermore, the majority of ICT jobs are at lower technical levels, including testers and web-designers.[74]

Industry-academia collaboration challenges

In Eastern Partnership countries, universities noted difficulties in adapting curricula to the needs of ICT companies. While university curricula should be updated every semester to keep up with industry needs, in **Georgia** regulations only allow changes every four years. In **Moldova**, policy restrictions similarly limit the potential for improved industry-academia collaboration. For example, IT industry professionals are not formally allowed to teach at universities (even part time) unless they have advanced degrees and pedagogical certification.

At the other end of the spectrum, **Bosnia and Herzegovina** has no strategy related to digital education. Digital competence is not explicitly addressed in the national curriculum or existing teacher competence frameworks. In addition, there are no learning outcomes related to digital competencies in the curriculum, which implies that there is no guidance from top-level authorities on its assessment.[75] Rather, digital skills are taught in the context of specific projects, such as ENABLE BIH, supported by international sponsors such as the United States Agency for International Development (USAID) and Save the Children, through which STEM principles were introduced into regular primary and secondary education. There are also many extracurricular enrichment programmes to increase the number of girls in STEM, including #ITGirls, Tech2Girls, Microsoft's DigiGirlz and CoderDojo.

Learning styles and materials

The current global economy requires STEM professionals with problem solving and critical thinking capabilities. However, both male and female students generally lack understanding of the relevance and real-world applications of technology. In fact, the way in which STEM subjects are taught influences girls' motivations to pursue technology careers later in life.

In some instances, STEM is perceived to be modelled on boys' interests. For example, girls and boys cite different motivations for pursuing technology careers; according to cross-country research, "making the world a better place" was cited as more important for girls than for boys, whereas boys more often cite salary as a motivating factor in their choice to pursue a STEM

[73] World Bank Group, 2017, "Assessment of firm-level skills demand and engagement in skills development: Creating a demand-led skills ecosystem in Moldova", available at http://documents1.worldbank.org/curated/en/600671512368522632/pdf/121811-WP-Moldova-private-sector-skills-Nov-2017-final-PUBLIC.pdf

[74] Ibid.

[75] Eurydice, European Commission, 2019, "Digital education at school in Europe", available at https://eacea.ec.europa.eu/national-policies/eurydice/content/digital-education-school-europe_en

career.[76] In contrast, girls' interest in technology grows once they understand its real-world applications.

For example, a study in **Bosnia and Herzegovina** showed that, with regard to STEM-related activities, girls were more interested than boys in understanding how things work and in solving social problems, such as finding cures to diseases, whereas boys were more interested in creating mobile applications or designing video games.[77] Similarly, in **North Macedonia**, girls tend to see technology as less relevant to their everyday lives and less linked to their interests, such as video games based on competition and destruction; instead, girls appear to be motivated by different types of games based on completion and fantasy.[78] Furthermore, the competitive and individualistic nature of STEM disciplines appear to be less attractive to girls and women overall.

Gender differences are also critical in the context of online learning. The kinds of assessments used and the way that they are administered can also influence girls' outcomes. For example, girls often have better mathematics scores in classroom tests – which has been attributed to the social aspect of the classroom – and perform slightly better in coursework and essay-type assessments.[79] In contrast, boys were found to do better in mathematics assessments using computer-based, rather than paper-based, formats. This has been attributed to spatial reasoning skills acquired through computer use, including through video games.[80]

Gendered attitudes and interaction in the classroom

Teacher attitudes and behaviours are influential on students' decisions. There is "a positive and significant association between the proportion of female mathematics and science teachers in secondary school and young women's probability of declaring a STEM major."[81] Teacher gender was not shown to have the same effect on boy's choice of studies, however.

Conversely, unconscious teacher bias has been well documented in STEM contexts around the world.[82] According to cross-cultural studies, teachers overall have been shown to interrupt girls more, call on and encourage boys more, pay more attention to boys and direct their gaze more to boys. According to one study, while girls tend to achieve higher scores on name-blind mathematics tests, when presented with recognizable female or male names on the same tests, teachers gave higher scores to boys.[83]

In several interviews and case studies reviewed for this report, girls recounted offensive attitudes displayed by particular teachers in the STEM field. These ranged from sexist jokes about female

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76 Andrew Trotman, 2017, "Why don't European girls like science or technology?", Microsoft, available at https://news.microsoft.com/europe/features/dont-european-girls-like-science-technology/

77 UN Women, 2019, "Gender gap in STEM fields and intervention programmes proposal (BiH)", unpublished report

78 Kristina Hadzi-Vasileva, 2019, "Mapping of gender in ICT sphere in Macedonia", Association for Progessive Communications, available at https://metamorphosis.org.mk/wp-content/uploads/2019/05/Gender-and-IT-Assesement-.pdf

79 UNESCO, 2017, "Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)", available at https://unesdoc.unesco.org/ark:/48223/pf0000253479_eng

80 Ibid.

81 Elizabeth Stearns et al, 2016, "Demographic characteristics of high school math and science teachers and girls' success in STEM", Social Problems vol. 63, issue 1, available at https://academic.oup.com/socpro/article-abstract/63/1/87/1845557?redirectedFrom=fulltext

82 Sara M. Lindberg et al, 2010, "New Trends in Gender and Mathematics Performance: A Meta-Analysis", Psychological Bulletin 136(6), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3057475/#R8

83 Victor Lavy and Edith Sand, 2015, "On the origins of gender human capital gaps: Short and long term consequences of teachers' stereotypical biases", available at https://www.nber.org/papers/w20909.pdf

students in **Moldova** to questioning whether women had enrolled in a technology-related faculty in **Ukraine** simply to "find a husband". Needless to say, teacher attitudes and beliefs about students' abilities affect students' confidence in and perception of their own skills.

Interactions between students may also influence girls' perceptions of their abilities. Studies in multiple contexts show that boys often perceive their male peers as stronger or more capable in STEM-related subject areas than their female peers.[84] For example, male university students in **Bosnia and Herzegovina** are more confident in the assertion that science is a better career choice for men than for women, that men are more talented in mathematics than women, that they are better scientists than women, that mathematics is a better career choice for men, that women like science less than men do and that women who enjoy studying computer sciences are strange. Male students also believe that men are generally more successful in their field of study.[85] In **Moldova**, some male IT students believe that girls should be testers (i.e. they should work in quality assurance) rather than coders engaged in programming and creating products.

Educational materials

Textbooks and learning materials themselves can also perpetuate or dispel stereotypes; for example, when female secondary students used textbooks with images of women scientists, they performed better than when they saw images of only male scientists.[86] Educational reforms in several countries include textbook revision, and awareness of the importance of representation is growing.

In **North Macedonia**, for instance, textbooks are being updated to include "respect for diversity (in terms of gender, ethnicity, religion, language, social status, intellectual and physical abilities)."[87] In **Ukraine**, the "New School" reform includes the creation of the first generation of gender-sensitive textbooks and the development of e-learning tools based on gender equality. According to the strategy, all documents produced as part of the reform will be subject to anti-discrimination expertise and adjusted on the basis of gender equality. In **Georgia**, the Business and Technology University uses pictures of women when advertising for professorships in computer sciences.[88]

3.3 Recommendations and best practices

Recommendation: Refine ICT-related indicators through meaningful access and connectivity targets

#skillbuilding #access #research #indicators

Key actors: governments/academia, NGOs

National statistics offices and other statistical entities must refine gender-related ICT indicators, using more robust measures of access. While women and men in the eight countries profiled

84 Daniel Z. Grunspan et al, 2016, "Males under-estimate academic performance of their female peers in undergraduate biology classrooms", PloS ONE 11(2), available at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0148405

85 UN Women, 2019, "Gender gap in STEM fields and intervention programmes proposal (BiH)", unpublished report

86 https://pubmed.ncbi.nlm.nih.gov/20397590/

87 Republic of Macedonia, 2018, "Education Strategy for 2018-2025 and Action Plan", available at http://mrk.mk/wp-content/uploads/2018/10/Strategija-za-obrazovanie-ENG-WEB-1.pdf

88 Nino Enukidze, rector of the Business and Technology University, Georgia, in conversation with the author

have relatively high degrees of digital access, more research must be done on intersectional digital divides, including examining how gendered digital divides are different in urban versus rural areas and among minority and underserved populations, etc. Both **North Macedonia** and **Serbia** have launched national gender equality indexes, which allow them to compare their performance with other European countries. Future indexes should include meaningful digital access indicators to measure the true state of women's and girls' access to technology.

International best practices

The Alliance for Affordable Internet (A4AI) has created a meaningful connectivity target.[89] This framework goes beyond basic access, measuring countries against minimum thresholds for regular access, appropriate devices, sufficient data and fast connection. A4AI found that, when using such measures, previously hidden gender gaps reappeared.[90] Measures should also be harmonized between countries to allow for meaningful comparisons between them.

Recommendation: Support extra-curricular STEM enrichment programmes for girls

#skillbuilding #practical_experience #mentorship #community_building

Key actors: international organizations, United Nations, private sector, NGOs

The national educational systems profiled in this report are undergoing various degrees of reform to incorporate twenty-first century STEM and digital skills into school curricula. However, changes come slowly; Ukraine's educational overhaul, for example, will last more than a decade. Furthermore, reforms may not be gender-sensitive. In the absence of strong, gender-sensitive technology programming within schools, NGOs, the United Nations and the private sector must fill the void through enrichment initiatives, including after-school and summer camp programmes.

Effective programmes improve problem-solving skills while exposing girls and young women to the real-life potential of IT, mentorship from successful women in the field and peer networks. Girls are more likely to pursue technology when they are encouraged by those around them and when they feel part of a supportive community that is going through the same experience. In addition to building on existing programmes and scaling up existing models, more support must be given to STEM enrichment programmes that can be replicated in other countries in the region.

Country-level best practices

In **Bosnia and Herzegovina**, the IT Girls project, jointly supported by UNICEF, UN Women and the United Nations Development Programme (UNDP), aims to demystify the ICT industry and encourage girls to pursue a career in ICT. The initiative promotes collaboration with the education and business sectors, offers resources for building digital skills and boosts girls' confidence and leadership through mentorship and entrepreneurship simulation activities. The initiative enjoys trust from the general public, as demonstrated by the successful 2018 crowdfunding campaign to provide Arduino sets to IT Girls clubs in 10 elementary schools, serving 200 girls.

[89] A4AI, 2020, "Women's rights online: Closing the digital gender gap for a more equal world", available at http://webfoundation.org/docs/2020/10/Womens-Rights-Online-Report-1.pdf

[90] Ibid.

In **Moldova**, GirlsGoIT provides girls and young women with digital, IT and entrepreneurial skills and encourages them to pursue a career in ICT. Over five years, 543 girls have received training in software development, engineering and electronics through boot camps, summer camps and other educational activities, including internships in IT companies. Girl-led local clubs have been established in 13 regions in Moldova, and participating girls have become ambassadors, organizing events in their home villages. GirlsGoIT is a joint initiative by UN Women Moldova, the eGovernance Agency, the Moldovan Association of ICT Companies, Novateca, TEKEDU (an NGO established to support quality education) and Moldova's National Agenda on Gender Equality.

In **Ukraine**, the STEM IS FEM initiative offers wide exposure to the STEM field to schoolgirls aged 12-17 years throughout the country. Through a series of two-day workshops, girls participate in "dive-in educational modules", lectures from role models and inspirational speakers, hands-on problem-solving challenges and visits to high-tech companies, among other activities. The aim is to offer career perspectives to enable girls to picture themselves working in a STEM-related field.

Modules include bioengineering, energetics and ecology, engineering and robotics, 3D modelling and printing, mechanical engineering, construction and architecture, and computer science and artificial intelligence. The goal of the modules is to foster a community of girls. Monthly online activities are also available after the workshops. While the programme is new, almost all participants have gone on to pursue STEM in higher studies.[91]

International best practices

The Tech4Girls programme aims to inspire underserved young women and girls aged 10 to 25 years to pursue STEM careers. It was established as a collaboration between the GSM Association (GSMA) and the EQUALS Global Partnership for Gender Equality in the Digital Age. Through a mixture of educational and skill-building workshops, exposure to leaders and mentors in the technology industry and connections with the corporate and technology sectors in specific countries, the programme aims to increase the talent pipeline and number of women employed in ICT. The goal is for 100 000 girls and young women to join the future technology talent pipeline over the next five years.

Recommendation: Expand the reach of enrichment programmes through cooperation with national educational systems

#skillbuilding #inclusiveness

Key actors: government (education ministries), private sector, NGOs and non-profits

While IT enrichment and skill-building programmes for girls are essential, they have limited scope and scalability. It is also more difficult for them to reach girls in rural or disadvantaged populations. In **Moldova**, for example, only 12 per cent of girls reported familiarity with GirlsGoIT or Tekedu, the two most well known organizations. The programmes were also more familiar to girls in urban areas.

To increase their effectiveness and reach, STEM enrichment programmes should cooperate with national educational systems to expand the programmes nationally, including among schools in rural areas, and to ensure that girls from under-represented groups (girls with disabilities,

[91] Polina Boichuk, STEM IS FEM Ukraine, in conversation with the author

Roma and ethnic minorities, girls from temporary placement centres for children in vulnerable situations, etc.) have the option to participate.

Country-level best practices

Tekwill, an educational technology company in **Moldova** that serves as a public-private partnership, cooperates with the Ministry of Education to integrate after-school technical education into secondary schools throughout the country. Courses range from programming languages to the logic behind algorithms. With the help of teachers already involved in STEM robotics courses as part of the FIRST LEGO League Moldova, Tekwill uses existing teacher networks to reach out to girls and invite them to participate in their courses.

Regional best practices

Regional initiatives are also important in light of the commitments made at the 2019 Digital Summit Belgrade, at which participating countries committed to ensuring that students in at least 50 per cent of schools in the Western Balkans "have an understanding of coding and the development of crucial competences related to computational thinking, such as problem solving, collaboration and analytical skills."[92] They also committed to encourage schools to participate in the European Union Code Week, a regional initiative that aims to showcase programming and technology to children in primary and secondary schools.

Another ambitious regional initiative is the 21st Century Schools programme designed and implemented by the British Council in cooperation with local ministries of education in the Western Balkans. This three-year education programme aims to reach up to 1 million students aged 10-15 years and 22 500 teachers across 4 500 primary schools throughout the region. All participating primary schools receive micro:bit devices (pocket computers) to help students learn new digital skills in a fun and interactive way, while the creation of code clubs encourages children to practise their programming skills. Support and training is offered to school leaders, teachers and parents in local languages. By the spring of 2020, approximately 10 700 teachers across the region – 71 per cent of whom were female – had completed micro:bit online training.[93]

Recommendation: Conduct further research into online and hybrid learning models from a gender perspective

#skillbuilding #access #research #inclusiveness #digital_education

Key actors: governments, the United Nations, NGOs and non-profits

While digital tools will never replace the value of face-to-face interactions, the COVID-19 pandemic has fundamentally changed perceptions around online learning. As online (or hybrid) learning models may persist long after the COVID-19 recovery period, more research is necessary to determine if and how they alleviate or exacerbate gender divides, both in formal and extracurricular education.

Although it is too early to cite best practices in this area, anecdotal evidence indicates that online learning may democratize access to STEM enrichment education. For example, during

[92] Western Balkans Digital Summit 2019, Belgrade, "Concluding statement", available at https://www.rcc.int/files/user/docs/4%20-%20Digital%20Summit%20Conclusions_03.04.2019.pdf

[93] British Council, "Coding across the Western Balkans", available at https://www.britishcouncil.org/work/partner/coding-western-balkans

the COVID-19 pandemic, STEM enrichment programmes previously marketed to small, elite groups of girls through a competitive process were made available online to all interested girls.[94]

The disadvantage of this format is that the bonding and mutual support usually shared between participating girls is diluted without face-to-face interactions. Furthermore, not every STEM-related module lends itself to online learning; some of the most exciting topics – such as robotics – require hands-on interaction. Going forward in a COVID-19 and post-COVID-19 environment, some hybrid combination of face-to-face and online learning may be the answer to ensure the right balance between quality interaction and scale of access, particularly for girls and underserved groups.

Recommendation: Facilitate partnerships between start-ups/ICT companies and technology training programmes to offer girls real world experience

#skillbuilding, #practical_experience, #mentorship #internships #apprenticeships

Key actors: private sector (ICT companies), academia, NGOs and public sector

According to Microsoft, the more practical experiences a girl receives during her education – inside or outside the classroom – the higher her interest in STEM.[95] This may also be connected to gender differences in self-confidence; without practical experience, girls are less likely than boys to feel sufficiently prepared for a STEM-related career.

More work should be done to facilitate partnerships between start-ups/technology companies and schools, universities and girls' coding programmes, etc. Matching girls with technology companies through internships, apprenticeships or work shadowing is an excellent and exciting way to expose girls and young women to real life situations. Participating companies must be explicit in embracing gender equality, however;

girls report that they would feel more confident pursuing a career in a STEM-related role if they knew that men and women had equal opportunities within the workplace.[96]

Country-level best practices

In **Georgia**, the Business and Technology University maintains close ties and cooperation with local technology companies. Representatives from local and international companies sit on the university board, and the IT curriculum is informed by industry needs. In this way, the university ensures that students gain the practical skills that they need for a seamless transition into their professional careers.

In **Albania,** Skills for Jobs (SJ4) launched a pilot project in April 2018 offering remote internships to ICT students in 10 vocational schools throughout the country. The purpose of the project was to address the low quality and status, insufficient financing, weak labour market orientation, and poor private sector engagement of vocational programmes. Furthermore, only 21 per cent of participants in vocational programmes are female; of the female participants, less than 16 per cent study ICT.

94 Polina Boichuk, STEMISFEM Ukraine, in conversation with the author
95 Andrew Trotman, 2017, "Why don't European girls like science or technology?", Microsoft, available at https://news.microsoft.com/europe/features/dont-european-girls-like-science-technology/
96 Ibid.

Using a combination of work-based learning, classroom technology and blended and individualized learning, students worked with leading ICT businesses in Tirana through practical assignments to be done in the classroom or at home. Through a combination of apprenticeships, career guidance and job-finding services, the project increased both the number of girls enrolled in VET programmes and the number of VET graduates joining the labour market.

Recommendation: Train teachers in digital literacy and competence to ensure effective use of technology in schools

#digital_literacy #mentorship

Key actors: government (ministries of education), academia

All teachers, whether or not they focus on STEM, must feel comfortable and supported in the use of digital tools and technologies. As underscored during the COVID-19 pandemic, more must be done to train teachers in the use of digital tools and to improve their digital competence. Effective online learning may involve different teaching methods than traditional in-person classrooms, and teachers should understand the variety of digital tools available both for remote learning and for engaging students in classroom settings. Digitally competent teachers (especially women) serve as role models for female students.

Country-level best practices

Serbia has created a model for training teachers in digital competences. In addition to the country's comprehensive Digital Competence Framework, which helps teachers self-assess and improve their digital skills, teachers can access more than 158 professional development seminars on media literacy and ICT skills. In addition, the non-profit Serbian Moodle Network works to foster a collaborative network of digitally competent teachers nationwide.[97]

Recommendation: Encourage gender-sensitive STEM learning environments

#skillbuilding, #mentorship #community_building #inclusiveness

Key actors: government (ministries of education), academia, United Nations, NGOs and non-profits, private sector (science/technology centres)

Programmes related to women, girls and technology often focuses on giving them the tools to "fit" into male-dominated environments, whether in school or work. However, rather than trying to "fix" female STEM students or supporting girls to "fit in", programmes should seek to change exclusionary environments. In other words, rather than focusing on how women are excluded from the field, educators must ensure that women are actively included.

The use of creative, interactive and hands-on experiences has been shown to work well with girls, and educators should be aware that different teaching styles may be more or less effective with different students. According to UNICEF, a gender-responsive, integrative approach to STEM education "entails breaking disciplinary silos, integrating science, technology, engineering and mathematics into a cohesive learning approach aimed at developing skills and knowledge via real-world applications." It also entails "actively and persistently challenging

[97] European Training Foundation (ETF), 2017, "Digital skills and online learning in Serbia", available at https://www.etf.europa.eu/sites/default/files/m/0A2814EFC7BF6440C125822E00573883_Digital%20factsheet_Serbia.pdf

gender stereotypes."[98] Involving teachers in creating such conducive environments is critical, for example through the use of platforms to share lesson plans and exchange experiences. Gender sensitivity training for STEM teachers also can be instituted to address conscious and unconscious teachers biases towards male and female students.

Country-level best practices

In **Ukraine**, a contest entitled "Best gender-sensitive STEM lessons: How to teach" was held to encourage teachers to design new, immersive approaches to ensure girls' engagement. Teachers in the fields of mathematics, physics, chemistry, computer science, technology, astronomy and geography, among others, submitted lessons plans that were judged on their creativity, innovativeness, use of equipment and gender sensitivity. Winning projects included a lesson on creation and research of the sun tracking system, which aimed to peak girls' interest in the field of energy; "Kitchen Science", an interactive English language lesson that integrated biology and chemistry with the aim of overcoming the stereotype that women's place is in the kitchen; and a mathematics project on skyscrapers of the world, which focused on eliminating gender stereotypes in architecture.[99]

International best practices

The Hypatia project is a consortium of European science centres and museums that strive to communicate STEM concepts in a gender-inclusive way. A core component of this vision is an accessible, practical and ready-to-use digital toolkit with innovative activities for adolescents. Every activity contains gender and facilitation guidelines for teachers, informal learning organizations, researchers and industry stakeholders. It is available in English, Albanian, Serbian and a variety of other European languages. Learning modules include identifying gender stereotypes in STEM, promoting gender inclusiveness in science teaching and learning about famous women in STEM.

In Norway, Girl Project Ada at the University of Science and Technology actively strives to achieve gender parity in the recruitment of female senior secondary school students. Through a series of technology camps and events, the university offers a hands-on experience to demonstrate how technology can be practical and fun. According to a professor involved with the project, "many things in the life of a modern young woman, like downloading music and videos, chatting, being on Facebook, talking to friends and the like, would not be possible without ICT. From an inclusion perspective, it is beneficial to show how this technology is useful, interesting and entertaining in daily life. This can increase girls' and women's interest in computers."[100] In its first year, the project increased the proportion of women studying computer science from 6 to 38 per cent. Now a permanent initiative, the project includes all the study programmes under the Faculty of Information Technology and Electrical Engineering.

Recommendation: Conduct research on the "leaky pipeline" between female STEM graduates and technology employment

#gender_disaggregated_data #research

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98 UNICEF, 2020, "Towards an equal future: Reimagining girls' education through STEM", available at https://www.unicef.org/media/84046/file/Reimagining-girls-education-through-stem-2020.pdf

99 United Nations Population Fund (UNFPA), 2019, "Teaching community has presented new standards for delivering gender-sensitive STEM lessons in schools", available at https://ukraine.unfpa.org/en/news/teaching-community-has-presented-new-standards-delivering-gender-sensitive-stem-lessons-schools

100 In conversation with the author

Key actors: government (national statistical offices), academia, private sector (ICT companies)

One of the most interesting findings of this report is the gap between the relatively high number of female STEM university graduates in Western Balkan/European Partnership countries versus the lower number of women who ultimately go on to work for science and technology companies. Further research is necessary to understand when and why women drop out of STEM-related career tracks. The standardization of data can also shed light on the so-called "leaky pipeline"; national statistical offices, for example, should standardize definitions of STEM, including gendered breakdowns of fields of study. Furthermore, the collection of more detailed statistics on women working in ICT, including job titles, can shed light on the percentage of female employees working in technical roles.

4 Gender equality in the ICT industry

> *"Why should we be satisfied with recruiting from only half the population?"*
>
> - *A professor, Girls Project Ada*

The argument for gender equality in technology is both ethical and practical.[101] As technology jobs command prestige and higher pay, increasing the number of women working in ICT is imperative for closing gender pay gaps. On the business front, not only would a larger pool of technical talent improve the overall quality of the ICT sector in the region, but diversity is vital for innovation and development, as companies that employ more women consistently outperform their competitors.[102] The importance of closing the digital gender divide has been noted in regional forums; participants at the 2019 Digital Summit Belgrade, for example, agreed to promote the Declaration on Gender Balanced Company Culture throughout the western Balkans.[103] Signatories to the declaration must commit to investing in women, promoting them to senior level positions and creating a welcoming company culture for both women and men.

This section explores the nature of the technology industry in the Western Balkan and the Eastern Partnership countries profiled in this report, including opportunities and challenges for recruiting and retaining women employees and encouraging women's advancement and leadership. This section focuses on both ICT companies and start-up ecosystems in each country.

4.1 Industry overview

While a fast-growing sector with highly paid jobs, the ICT industry suffers from a shortage of qualified talent. In the countries profiled in this report, this is due to the lack of properly trained workers, corruption and aging populations, as well as "brain drain", namely the emigration of

[101] EQUALS, 2019, "Taking stock: Data and evidence on gender equality in digital access, skills, and leadership", available at http://itu.int/go/EqualsResearch2019

[102] Catalyst, 2020, "Women in management: Quick take", available at https://www.catalyst.org/research/women-in-management/

[103] Western Balkan Countries Information Platform on Research Technology and Innovation (WBC-RTI), 2020, "Western Balkans' great progress transitioning into a digital economy", available at https://wbc-rti.info/mobile/object_view/20796

technical talent to countries with better salaries and living conditions. In fact, according to a report issued by the World Economic Forum, three Balkan countries – **Bosnia and Herzegovina**, **North Macedonia** and **Serbia** – are among the top ranked countries in the world for brain drain.[104] The same report noted **Ukraine**'s low capacity to retain talent (ranking 129 out of 137 countries), with 10 per cent of the country's 20 million-person labour force working abroad at any given moment.[105] In **Moldova**, about one third of citizens are living abroad, making remittances an important part of the economy.[106]

Given the gender gaps within the industry, along with the shortage of qualified workers, it seems natural for ICT companies to focus on women. However, recruiting women to technical jobs, retaining them and giving them the tools to advance within companies has proven challenging. Even women with the necessary education and qualifications may find it difficult to keep up with the work pressure, long hours and updates in skills and knowledge necessary to remain competitive in the ICT industry while balancing those demands with family life.[107] The COVID-19 pandemic may be exacerbating this issue, as increased caretaking responsibilities cause more women than men to drop out of the workforce.

The effects of the COVID-19 pandemic on international outsourcing, a main component of the IT sector in the region, also remain unclear. Whereas large global technology companies have been immune to the ravages of the pandemic – or have even benefited from a digital upsurge – IT outsourcing has suffered a decline, as many clients or potential clients in the United States and Europe work in impacted industries, such as retail, travel and transportation.[108]

Women working in ICT

Despite the relatively high number of STEM graduates in the countries profiled, women are less likely than men to consider a technical career. When they do, they remain under-represented in decision-making positions in both public and private sectors. Women in ICT occupy more low-level jobs and tend to be in junior and supporting positions rather than managerial roles.[109] In fact, the percentage of female managers in ICT sectors is low across all eight countries.

Women also tend to leave technology and engineering jobs at higher rates than men. This "leaky pipeline" can be seen across the board. Similar gender divides are observed across all eight countries profiled in this report, regardless of whether the ICT industry is small, as in **Bosnia and Herzegovina** or **Albania**, or whether it represents a significant part of the country's economic

[104] World Economic Forum, 2019, "The Global Competitiveness Report 2019", available at http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

[105] Anton Waschuk and Andriy Kamenetskyy, 2020, "How Ukraine can go from brain drain to brain gain", Atlantic Council, available at https://www.atlanticcouncil.org/blogs/ukrainealert/how-ukraine-can-go-from-brain-drain-to-brain-gain/

[106] Valeria Hutuleac, 2020, "Moldova Braces for Large Numbers of Returning Migrants", International Organization for Migration, available at https://rovienna.iom.int/story/moldova-braces-large-numbers-returning-migrants#:~:text=Almost%20one%20million%20of%20the,%2C%20entertainment%2C%20or%20hospitality%20industries

[107] Sylvia Ann Hewlett, 2014, "What's holding women back in science and technology industries", Harvard Business Review, available at https://hbr.org/2014/03/whats-holding-women-back-in-science-and-technology-industries

[108] Karl Flinders, 2020, "Huge declines in traditional outsourcing as Covid-19 puts a stop on deals", Computer Weekly, available at https://www.computerweekly.com/news/252486168/Huge-declines-in-traditional-outsourcing-as-Covid-19-puts-a-stop-on-deals

[109] W. DuBow and J.J. Gonzalez, 2020, "NCWIT Scorecard: The Status of Women in Technology", National Center for Women and Information Technology, available at https://www.ncwit.org/resources/ncwit-scorecard-status-women-computing-2020-update

growth, as in **Ukraine**. However, one positive trend is that the number of women working in ICT is growing across all eight countries.

In each of the countries profiled, similar gender divides persist. **Ukraine** is a technology powerhouse with around 4 000 IT companies, mainly providing outsourcing services. In fact, Ukraine is the largest exporter of IT services in all of Europe. The industry has been growing by 30 per cent annually, employing between 25 000 and 30 000 new specialists every year.[110] Many entry-level IT jobs in Ukraine are filled by "switchers" – employees from other industries attracted by the stability and high salaries offered in the high-tech world. The number of switchers has increased so quickly since 2014 that technology companies are offering educational courses and hiring career consultants to help potential employees "switch first and then grow from junior positions to top ones."[111] The Ukrainian Government is also helping to meet demand through the IT Creative Fund for training new technology experts and re-skilling people from adjacent disciplines.[112]

However, according to data from the Ukrainian Ministry of Justice, women represent just 24 per cent of the industry.[113] Furthermore, the number of women working in technical roles is much lower. According to a 2019 survey of technical specialists in Ukraine, less than 14 per cent are female, although the number appears to be growing. More than half of Ukrainian women in IT are quality assurance engineers, a position with a lower barrier of entry, and the majority of women are young, junior employees.[114]

In **Serbia**, IT is the fastest growing sector. In addition to more than 2 500 active software companies, many large firms – including Microsoft, Adobe, Oracle, Google, IBM and Siemens – have partnered with Serbian companies for their back-office development tasks. According to the national plan for the advancement of women in ICT, women's participation in the IT sector has reached 31 per cent and continues to grow.[115] However, only around 14 per cent of programmers are women, which is in line with the industry average in Silicon Valley.[116] Furthermore, the average monthly wage for women programmers is some EUR 400 lower than for men, and there is a 15 per cent gender pay gap in the ICT sector.[117]

In **Moldova**, the ICT sector, and outsourcing services in particular, are growing, albeit not at the breakneck pace of neighbouring countries. Approximately 1 760 ICT companies have been registered. IT exporting/outsourcing services have increased ten-fold in the past eight years, with international customers such as JPMorgan Chase & Co, HSBC, UBS, Barclays Capital,

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110 Ukrinform, 2019, "Government initiates launch of IT Creative Fund", available at https://www.ukrinform.net/rubric-economy/2773083-government-initiates-launch-of-it-creative-fund.html

111 Canada-Ukraine Chamber of Commerce, 2017, "Ukraine has one of the hottest tech scenes in Europe", available at https://www.cucc.ca/2017/07/19/ukraine-has-one-of-the-hottest-tech-scenes-in-europe/

112 Evolve, "Salaries", available at https://www.evolve-consultants.co.uk/2020/01/27/ukrainian-tech-landscape-2020-it-exports-talent-pool-salaries/

113 IT Ukraine Association, 2018, "The number of women, who want to work in IT, is getting bigger", available at https://itukraine.org.ua/en/the-number-of-women-who-wants-to-work-in-it-is-getting-bigger.html

114 Anastasia Stefanuk, "Ukrainian Women-In-Tech", Mobilunity, available at https://mobilunity.com/blog/ukrainian-women-in-tech/

115 Republic of Serbia, 2020, "**Програм за оснаживање жена у области информационо-комуникационих технологија за период 2019-2020. Године**", available at https://mtt.gov.rs/download/program.pdf

116 Tesla Nation, "The Serbian tech scene", available at https://teslanation.org/the-serbian-tech-scene/

117 Radmila Radojevic and Simeona Petkova, 2018, "Mapping 'Women in Technology' Issue Networks across Bulgarian, Croatian, and Serbian National Google(s)", Studies in Russian, Eurasian and Central European New Media (digitalicons.org) No. 19, available at https://www.digitalicons.org/wp-content/uploads/2019/02/DI19_5_Radojevic_Petkova.pdf

Fujitsu, Ubisoft and Orange. In 2016, a law on IT parks was issued to create the first Moldovan technology centre, which has over 550 resident companies and 9 700 employees.[118]

Women occupy 31 per cent of jobs in the ICT sector. However, this includes a large number of women without a technical background or higher education who occupy lower-level positions. Postal carriers, for example, are included in the "communications" component of Moldova's ICT sector. The gender wage gap is also the most extreme, with women's wages reported to be 33 per cent lower than men's.[119]

In **Bosnia and Herzegovina**, the ICT sector is one of the fastest growing, characterized by young companies and small enterprises. It specializes in software development, project management and consulting, predominantly exported-oriented. However, it suffers from an acute lack of technical talent. In fact, according to research by the Bit Alliance, Bosnia and Herzegovina will face a deficit of around 6 000 people in the IT sector in the next five years. Between 60 and 70 per cent of the workforce in Bosnia and Herzegovina are young people up to 35 years of age, and women comprise approximately 29 per cent of employees in the sector.[120] However, men are better paid than women, even for the same position. For example, the average salary of a male programmer is USD 1 033 per month, while women in the same position earn only USD 810.[121]

ICT is the fastest growing industry in **North Macedonia,** with a skilled workforce of young, well educated IT specialists. According to the most recent assessment in June 2020, there are 1 957 active companies in the industry.[122] Technical talent, along with some of the lowest labour costs in the region, has encouraged large ICT companies – including Microsoft, Cisco, Oracle, Dell, Compaq, Hewlett Packard, IBM, Sun Microsystems, Apple and Lotus – to develop a presence there via branch offices, distributors, dealers, resellers, solution providers and business partners.[123] However, women comprise only 27 per cent of the IT workforce and only 12 per cent at management level.[124]

In **Albania**, the ICT sector remains very small and has a severe shortage of talent. Albania lags behind in the development of a modern and accessible IT infrastructure, and historically there has been little emphasis on that area. Furthermore, there is a large gap between IT graduates' knowledge and skills and industry needs, even for lower-level positions. As a result, many firms provide intensive (and costly) in-house training for graduates, sometimes lasting up to six

118 Republic of Moldova, 2016, "Law no. 77 of 21.04.2016 on information technology parks", available at https://moldovaitpark.md/wp-content/uploads/2019/09/Law-77_2016.pdf

119 Rodica Nicoară and Maria Vremiș, 2019, "Femeile și bărbații în sectorul tehnologiei informației și comunicațiilor (TIC)", available at https://statistica.gov.md/public/files/evenimente/2019/TIC/Studiu_analitic_Femei_Barbati_TIC.pdf

120 https://www.facebook.com/zenskaposla.ba/?hc_ref=ARTryezQmPHIzpU9cXcdKChdS8FnK2dtqNwr40I_obZiBORLtnpq9BZ22C4qXjZM9N0&fref=nf&__tn__=kC-R

121 Plata, "Samo 6% zaposlenih žena je među najbolje plaćenim zaposlenicima", available at https://www.plata.ba/analize/samo-6-zaposlenih-zena-je-medu-najbolje-placenim-zaposlenicima/50378

122 Chamber of Commerce for Information and Communication Technologies, North Macedonia, 2020, "ICT industry in North Macedonia: General mapping report", available at https://masit.org.mk/wp-content/uploads/2020/09/masit_report_v1.00.pdf

123 PwC North Macedonia, 2020, "ICT sector study: North Macedonia, Albania, Kosovo", available at https://www.netherlandsworldwide.nl/documents/publications/2020/06/26/ict-sector-study---albania-kosovo-and-north-macedonia

124 "IME (increasing market employability) research on gender sensitive policies and practices for managing of human resources in software development companies and IT services in Macedonia", 2015, internal report

months.[125] IT companies also suffer from a lack of specific management knowledge related to decision-making, operational efficiency, quality control and cost management.[126]

Unlike other Balkan countries, the Albanian IT sector has never found a competitive advantage. The small size of the sector does not allow for economies of scale, making subcontracting or off-shoring services impractical.[127] While approximately half of all female university students are enrolled in faculties related to ICT (figures range from 49 to 54 per cent), no data are available on the number of women working in ICT, reflecting both the small size of the industry overall and the lack of attention to gendered ICT-related employment outcomes.

ICT sector development and integration into the global economy is a cornerstone of **Georgia**'s social and economic development. There are approximately 1 000 companies and organizations active in the technology field, primarily operating in computer programming and consultancy, followed by telecommunications and wholesale trade in ICT equipment.[128] Georgian banks hire the greatest number of technical employees in the country.

While currently underdeveloped, the ICT field in Georgia is growing steadily, with new government-instituted financial and tax incentives and new policy and institutional instruments to strengthen the sector. The Government, the private sector and several universities have introduced short-track IT and web/mobile development training programmes to leverage the initial supply of qualified professionals in the field, and some dozen centres offer programming education with certification. However, just 12 per cent of women in Georgia are employed in careers related to science, technology and engineering.[129]

Montenegro is a small country which recognizes ICT as one of the most important sectors for future economic development, supporting all other sectors of the economy.[130] There are around 400 active ICT companies in the country, with strong foreign investment in telecommunication operators. Innovation mainly comes from start-ups and smaller companies with fewer than 20 employees, and bigger local companies are often reluctant to innovate. According to UNDP, while overall digital competence and literacy is low in the country, IT specialists are some of the most talented but lowest paid compared to neighbouring countries.[131] No reliable data are available regarding the number of women working in ICT.

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125 Center for Business Technology and Leadership, 2015, "Gender-sensitive research on ICT sector in Albania", available at http://risialbania.al/index/wp-content/uploads/2016/04/Gender-Sensitive-Research-on-ICT-Sector-in-Albania.pdf

126 Ibid.

127 Ibid.

128 USAID Governing For Growth (G4G) in Georgia, 2017, "Innovation and technology in Georgia: Annual report 2017", available at https://www.pmo-bc.com/storage/app/uploads/public/5ce/795/dba/5ce795dba596c190438918.pdf

129 EU4Digital, 2020, "How women can change the field of innovation in Georgia", available at https://eufordigital.eu/how-women-can-change-the-field-of-innovation-in-georgia/

130 World Bank, 2018, "Montenegro growth and jobs: Report I", available at http://documents1.worldbank.org/curated/en/787451545030793133/pdf/Montenegro-Growth-and-Jobs.pdf

131 Kaca Djurickovic, UNDP Gender Programme Officer Montenegro, in conversation with the author

Women's advancement and leadership

> *"In addition to thinking of how to get more women into tech, we need to think about what we are doing for women already in tech."*
>
> - *Former manager, IT company in Albania*

The low overall number of women in ICT fields becomes more pronounced at senior levels. In **Bosnia and Herzegovina**, only 10 per cent of companies have a woman in a managerial position, while in **North Macedonia,** that figure stands at 12 per cent.[132] In all countries in the region, the same barriers to women's advancement to senior and top managerial positions were noted, including: women's greater family responsibilities; social norms discouraging men to take family leave; masculine corporate culture; lack of flexible work solutions; gendered stereotypes; and a lack of managerial experience among women. Furthermore, many ICT jobs require travel, which may be harder for women, whose childcare responsibilities make them less free to travel abroad.

Such barriers may hinder women with advanced degrees from joining ICT companies to begin with. For example, in **Serbia**, even though twice as many women than men obtain doctoral degrees in computer programming, Serbian women are less represented at the top managerial level in IT companies. They tend to prefer to go into teaching or academia, fields viewed as providing a higher quality of life and more flexibility in work-life balance.[133]

The lack of women in senior and decision-making positions leads to a vicious cycle whereby younger female employees have no role models to emulate or to encourage them to rise to high-level positions. This is particularly critical, as women who reach senior positions often bring other women along with them; women who work in ICT are more likely to work under female supervision.[134] According to a recent study by EQUALS focused on middle and senior-level management positions from across mobile and technology industries, women identify more strongly than men as "hands-on" transformational leaders who are more concerned with other's abilities and desire to succeed.[135]

According to interviews gathered for this report, providing a safe and comfortable environment for women employees is important in predominantly male settings. Issues ranging from "loneliness" to "being subjected to sexualized comments that diminish you as a professional" were raised as some of the challenges that prevented women from remaining in the field. As a former IT manager in **Albania** noted, "women need to work twice as hard to be taken seriously and respected."[136]

Retention is another pain point in the ICT industry, in which recruiting and onboarding new employees is time-consuming and costly. In **North Macedonia**, for example, the lack of qualified

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132 "IME (increasing market employability) research on gender sensitive policies and practices for managing of human resources in software development companies and IT Services in Macedonia", 2015, internal report

133 Gaia Montelatici, Impact Hub Belgrade, in conversation with the author

134 EIGE, 2018, "Women and men in ICT: A chance for better work-life balance – Research note", available at https://eige.europa.eu/publications/women-and-men-ict-chance-better-work-life-balance-research-note

135 EQUALS, 2020, "Perceptions of power: Championing female leadership in tech", available at https://www.gsma.com/betterfuture/resources/perceptions-of-power-championing-female-leadership

136 Edlira Kasaj, Digital entrepreneur and ICT specialist, in conversation with the author

employees creates competition between existing companies to recruit the best talent.[137] In such an environment, IT companies must increase their benefits to remain attractive in an environment of high employee turnover. With the exception of Ukraine (and, to some extent, Serbia, which has a population of 8.7 million), the countries profiled in this report are small and have early-stage IT ecosystems. Most have neither the resources nor the maturity to invest in advanced human resource processes or benefits appealing to women, such as generous parental leave.

Despite the fact that women leave the industry in higher numbers, they were described both by their employers and in their own testimonials as more "loyal" to the company. This can be viewed as a double-edged sword; while on the one hand it could demonstrate a lack of empowerment or negotiation skills – that women prefer stability and are willing to take fewer risks to advance their careers – on the other hand, this fact can be used to negotiate better benefits in an industry with high turnover.

As a fast-moving industry with rapidly changing protocols, ICT employees must upgrade their skills on a regular basis. Training and certifications are not only key for individual advancement but are necessary to demonstrate the competence of employees and win projects with clients abroad. In **North Macedonia**, it was noted that more men than women participate in such training, as women face greater difficulty in balancing family duties with a full-time job and additional coursework.[138] However, women motivated to advance in their careers may be willing to make greater sacrifices; research in **North Macedonia** found that women in ICT were not using their full maternity leave for fear of falling behind in their careers.[139]

A related issue is the lack of clear path for advancement within smaller ICT companies. Without a specific structure or hierarchy of positions within the company, there is no budget for training or plan for gaining certifications, and it is difficult for employees to set goals of "where they see themselves in five years".[140] This lack of pathway for advancement may affect women more than men.

COVID-19 work culture: The "new normal"

The new work-from-home culture ushered in by the COVID-19 pandemic brings new opportunities and challenges for gender equality in the context of ICT. According to Eurostat, only one third of people with higher formal education had experience with teleworking in 2018, and only one fifth used the Internet in their work when working from home.[141] The switch to remote working during the pandemic represents a huge adjustment, with lasting implications for economies and employment.

Relative to other industries, however, ICT was more prepared for the switch and has the infrastructure and tools to make teleworking effective for the long term. According to various studies, ICT jobs provide more potential for remote work and flexible hours than many other occupations.[142] This includes the ability to take time off during the day and compensate in the evenings or at other times. Online project management tools allow for real-time collaboration

[137] Zaklina Gestakovska, Lead researcher, integrating gender into ICT company policies, North Macedonia, in conversation with the author
[138] Jasmina Trajkovski, information security consultant, North Macedonia, in conversation with the author
[139] Zaklina Gestakovska, lead researcher on integrating gender into ICT company policies, North Macedonia, in conversation with the author
[140] Jasmina Trajkovski, information security consultant, North Macedonia, in conversation with the author
[141] OECD, "The COVID-19 crisis in the Western Balkans", available at http://www.oecd.org/south-east-europe/COVID-19-Crisis-Response-Western-Balkans.pdf
[142] EIGE, "Gender statistics database", available at https://eige.europa.eu/gender-statistics/dgs

and connection to remote teams in different time zones. The nature of ICT work, often more about meeting deadlines than working at specified times, in theory adds to work flexibility.

How ICT companies are dealing with COVID-19 restrictions

During lockdowns in **Bosnia and Herzegovina**, many IT companies eliminated working hours altogether, allowing employees to work when convenient. Some IT firms allowed employees to take hardware home or shipped products to them to make remote work as comfortable as possible. Increased emphasis on "remote socialization" through online games and quizzes replaced face-to-face interactions and fostered camaraderie, despite physical separation.[1] In **Moldova**, telecommunication company Orange created employee support packages, with particular attention paid to mental health. In addition to a flexible-hours system and quality online classes for employees' children, workers were offered psychological counselling as part of their health insurance packages.

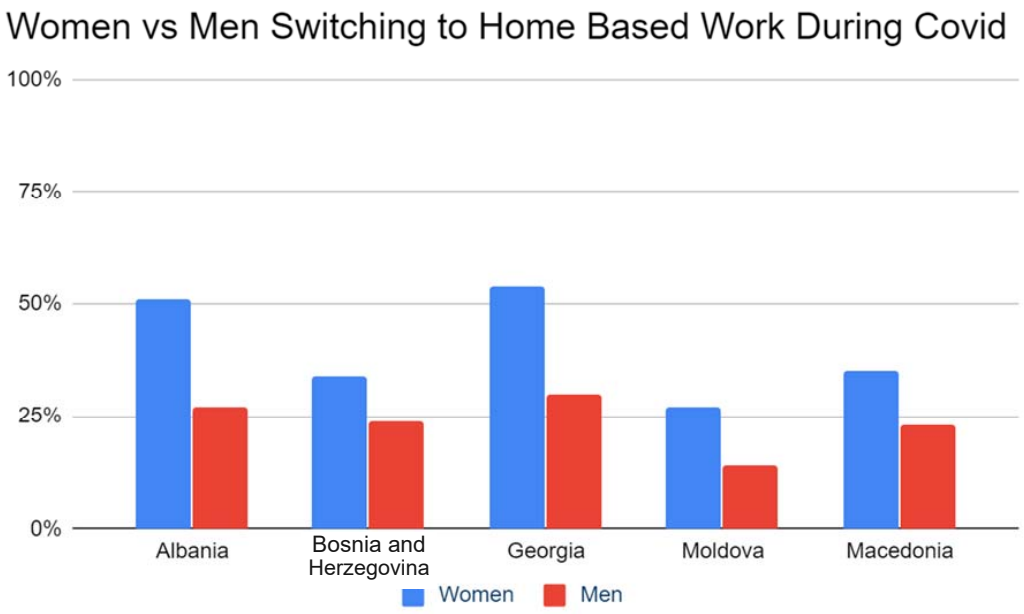
[1] Zerina Mandzo, IT Girls project officer, Bosnia and Herzegovina, in conversation with the author.

In general, IT corporate culture ties employee benefits to productivity. The disadvantage of greater flexibility, however, is longer work hours and less separation between home and work life. In the context of COVID-19 restrictions, many women find it difficult to be productive at home, with children needing parental time and attention. "Normal" ways of addressing this, such as hiring outside nannies or seeking help from grandparents or other family members, were not an option during the pandemic. For many women, total working hours became longer during COVID-19 lockdowns, due to the constant stream of interruptions from children. For some, physically being at home led to the expectation (and reality) that they would engage in a larger share of childcare and domestic responsibilities.

According to a rapid gender assessment conducted by UN Women in five of the countries profiled for this study (**Albania**, **Bosnia and Herzegovina**, **Georgia**, **Moldova,** and **North Macedonia**), significantly more women than men switched to home-based work during the spring of 2020.[143] At the same time, more women than men reported spending more time on unpaid care and domestic work. While the numbers differed slightly, this same pattern held true in every country surveyed.

[143] UN Women, 2020, "The impact of COVID-19 on women's and men's lives and livelihoods in Europe and Central Asia: Preliminary results from a rapid gender assessment", available at https://www2.unwomen.org/-/media/field%20office%20eca/attachments/publications/2020/07/the%20impact%20of%20covid19%20on%20womens%20and%20mens%20lives%20and%20livelihoods%20in%20europe%20and%20central%20asia.pdf?la=en&vs=5703

Figure 4: Switching to home-based work during COVID-19 for men and women



Source: UN Women rapid gender assessments, 2020

Retraining women to enter ICT fields

Across the Western Balkans and the Eastern Partnership region, the COVID-19 pandemic is affecting women's economic security. According to a rapid gender assessment conducted by UN Women, more than 15 per cent of women reported losing their job owing to COVID-19 restrictions, and another 41 per cent reported a reduction in working hours.[144] Many have taken unpaid leave, and many more are now working from home owing to social distancing measures. Most alarmingly, during the spring of 2020, more women than men in **Albania**, **Georgia** and **Moldova** reported that they would face difficulties paying for basic expenses, including food, rent, utilities and basic hygiene products, if COVID-19 restrictions continued.[145]

Such disruptions to the labour market have long-term consequences. Given the "high returns to experience", women absent from the labour market for lengthy periods of time may suffer a disadvantage in terms of earnings and advancement potential.[146] Furthermore, many jobs lost may take years to recover or may never return.

As part of COVID-19 recovery, there is a clear need and opportunity to train unemployed and underemployed women for new opportunities within ICT. Upskilling and retraining women for higher paying, in-demand jobs in technology will be critical to ensure economic security in uncertain times, as well as addressing the shortage of skilled workers within the ICT industry.

144 Ibid.
145 Ibid.
146 OECD, 2020, "Tackling coronavirus (COVID-19): Contributing to a global effort – The COVID-19 crisis in Ukraine", available at https://www.oecd.org/eurasia/competitiveness-programme/eastern-partners/COVID-19-CRISIS-IN-UKRAINE.pdf

International best practices: "Incentive-aligned" skill-building models

New "incentive-aligned" skill-building models can help women and under-represented groups enter technology fields. One example is the **Lambda School,** a virtual technical training programme in the United States where students study coding, data science, application development and machine learning. Lambda School employs a deferred tuition model called an income share agreement, whereby students pay only if they obtain a job with a salary of USD 50 000 or higher. In this case, they repay the tuition out of their pay checks once already employed. The financial agreement aligns the school's incentives with students' goals, as the school is paid only when and if the students find a job. According to the school's diversity report, approximately 25 per cent of students are women and one third belong to minority communities.

In France, the new **Microsoft AI School** is a free, intensive seven-month course to help unemployed and underemployed individuals develop artificial intelligence skills. Following the course, students are employed for 12 months at participating partner companies. Students represent a diverse group of men and women, selected by Microsoft partner Simplon, a social enterprise providing free digital training for people of all backgrounds. Not only does this upskilling model offer training for in-demand jobs of the future, but it addresses the shortage of skilled technical talent in Microsoft and partner companies.

4.2 Start-up ecosystems

Start-up ecosystems have a positive impact on the creation of new businesses. Like the ICT industry, technology start-ups are a force for economic growth in the Western Balkans and in Eastern Partnership countries. However, brain drain, corruption and a lack of investment capital also pose a challenge for start-ups in the region. The situation will mostly likely only become more difficult in the context of the COVID-19 pandemic and post-pandemic recovery.

Nevertheless, a nascent ecosystem of start-up and innovation hubs in the Western Balkans has emerged in recent years, with approximately 1 200 start-ups across **Albania**, **Bosnia and Herzegovina**, **North Macedonia**, **Montenegro** and **Serbia**.[147] The success of a few larger software and gaming companies in **Bosnia and Herzegovina** and **Serbia**, among others, is inspiring a generation of start-up founders with global ambitions. In addition to providing direct support, these companies have legitimized start-ups as a viable career choice.[148]

Male compared to female start-up founders

Serbia is by far the start-up leader in the Western Balkans, with more than 600 companies comprising more than half of all start-ups in the region. Dubbed a "top ten European ecosystem" for affordable talent, support for the Serbian start-up ecosystem includes free workspaces, a

[147] ABC Accelerator Group, 2017, "Southeast Europe startup report 2017", available at https://www.eitdigital.eu/fileadmin/newsroom/publications/Southeast_Europe_Startup_Report_2017.pdf

[148] Ibid.

number of accelerators and incubators, innovation funding and tax incentives. Growth has also fuelled the opening of new venture capital funds.[149]

However, only 12 per cent of Serbian start-up founders are women, and the number of technical female founders is even smaller: only one out of every 175 chief technical officers in Serbia who has raised series A or B funding is female.[150]

Other countries in the region have even smaller numbers of female founders – mostly too small to keep accurate statistics. For example, in **Bosnia and Herzegovina**, only 10 per cent of start-up founders are women.[151] Overall, entrepreneurship in the Western Balkans remains underdeveloped among women, owing to a general preference for secure, predictable public sector jobs, the avoidance of risk-taking and the lack of available support services such as childcare and benefits for the self-employed. Women are generally reluctant to start their own businesses because of limited exposure to the business world, limited financial skills and difficult business environments.[152]

International best practice: Start-up school for new mothers

Although maternity leave is not often associated with career development, that is exactly the premise of Google's Campus for Moms. Pioneered in Israel and adopted in other countries, including the United Kingdom, Germany, Poland and the Republic of Korea, this free, child-friendly start-up school encourages new mothers to attend sessions together with their babies. The idea is that new motherhood is a time for personal development and can be an excellent opportunity to start a new business. As with other accelerators, Campus for Moms includes sessions led by successful entrepreneurs, investors, technology experts and others. The sessions cover success stories, the financial and legal aspects of running a company, and pitch and presentation skills. Unlike other programmes, mattresses and diaper-changing facilities are made available during the sessions. In some countries, on-site childcare is provided. The peer support provided by the programme is critical to helping young mothers thrive as they balance their personal and professional lives.

The situation is similar in **Moldova**, where a small start-up ecosystem is beginning to take hold, including the establishment of the first local start-up investment fund and the creation of a few start-up accelerators and co-working spaces. However, most founders with ambitions move abroad, and there is little support for founders in general, let alone specifically for women. The situation is better in the start-up ecosystem of **Ukraine**, where venture capital money flows to homegrown start-ups, a number of corporate acceleration programmes have been launched,

149 Vojvodina ICT Cluster, 2020, "ICT in Serbia at a glance, 2020", available at https://www.ict-cs.org/fileadmin/user_upload/ICT-in-Serbia-At-a-Glance-2020.pdf

150 Digital Serbia Initiative, 2019, "Startup Scanner 2019: How are startups doing in Serbia?", available at https://www.dsi.rs/wp-content/uploads/2020/01/Startup-skener_2019_ENG.pdf

151 Jasna Hamzabegović and Fatka Kulenović Ba. Nejra Mesić, 2018, "Perspectives of Bosnian women in the field of IT", International Journal of Engineering and Science vol. 7, available at http://www.theijes.com/papers/vol7-issue7/Version-1/F0707014956.pdf

152 World Bank, Agency for Statistics of Bosnia and Herzegovina, Federal Institute for Statistics of Bosnia and Herzegovina and the Republika Srpska Institute for Statistics, 2015, "Bosnia and Herzegovina: Gender Disparities in Endowments, Access to Economic Opportunities and Agency", available at https://openknowledge.worldbank.org/handle/10986/22471

and a growing number of technology events and conferences are held. To date, around 320 start-ups have been founded. According to the Ukrainian Venture Capital and Private Equity Association (UVCA), 26 per cent of companies that have raised funding have at least one woman among the founders.[153]

The start-up ecosystem in **Georgia** is in the very early stages, with few support mechanisms for founders, either male or female. While the Government supports innovative ideas and technology start-ups, commercial banks are typically the main investors and funders, as well as the largest employers of technical talent.[154] Nonetheless, the ecosystem is changing, and interest and investment from foreign countries is growing. For example, 500 Startups, the largest accelerator in the United States, recently opened in Tbilisi. In 2017, an Israeli technology hub opened at the Georgian Business and Technology University, presenting opportunities for training Georgian talent and for remote work for start-ups and companies in Israel. However, it is still considered unusual to found a start-up rather than pursue a safe and secure career, with women judged more harshly than men for putting professional aspirations above family ambitions.[155]

Overall, there are few women company founders in the Western Balkans and Eastern Partnership countries, with limited initiatives targeted specifically for them. It is therefore no surprise that women founders from the region often live abroad or have spent significant amounts of time outside their native country. In fact, female start-up founders interviewed for this report credit their time overseas for "giving them the courage" to pursue entrepreneurship. Many women founders in the region also worked in technology-related enterprises at universities, accelerators or innovation hubs before launching their own ventures. As such, they are already familiar with start-up and innovation ecosystems, including existing programmes and support systems. Often their background is in business or marketing rather than technology, and they commonly found start-ups to solve problems that they have personally experienced.

Access to capital

While any start-up founder needs an economic "safety blanket" and/or a high tolerance for risk in order to found a company, women tend to be less financially risk averse than men when launching start-ups or ICT-related companies. This is logical considering the high number of start-ups that close or that take long periods of time to become profitable; according to one survey in **Serbia**, "out of 749 software companies established in the period 2016-2018, 311 of them are still without employees or revenues."[156]

[153] InVenture, 2019, "Ukrainian Venture Capital and Private Equity Overview 2019", available at https://inventure.com.ua/en/analytics/investments/ukrainian-venture-capital-and-private-equity-overview-2019

[154] USAID Governing For Growth (G4G) in Georgia, 2017, "Innovation and Technology in Georgia: Annual report 2018", available at https://www.pmo-bc.com/storage/app/uploads/public/5ce/795/dba/5ce795dba596c190438918.pdf

[155] Nino Dvalidze, founder of My Nanny, Georgia, in conversation with the author

[156] Vojvodina ICT Cluster, 2020, "ICT in Serbia at a glance, 2020", available at https://www.ict-cs.org/fileadmin/user_upload/ICT-in-Serbia-At-a-Glance-2020.pdf

In all countries profiled in this report, risk aversion is further compounded by a lack of access to investment capital. While female-founded start-ups have been proven to offer higher returns overall, on average they receive significantly less funding than male-founded start-ups and have lower valuations. Overall, a lack of angel (private) investors and a shortage of early-stage venture capital in the countries profiled make it difficult to raise domestic investment.

Although angel investment fills an important gap for early-stage founders yet to release a product or demonstrate traction, there are few angel investors in the region, either male or female. Early-stage ventures are highly risky and prone to failure. According to a woman angel investor in **Serbia**, social and cultural notions of failure as "shameful" may stop professionals from becoming business angels. Other barriers include a lack of knowledge about investment mechanisms and how they are locally applied, insufficient knowledge of how to source and assess deals, and a lack of self-confidence about the kinds of assistance that individual investors can offer to start-up founders. Furthermore, the perception of a typical investor as a "high net worth male" may hinder professional women from taking the leap.[157]

Bank loans – an alternative source of capital for start-ups in this region – are harder for women to obtain. For example, in **Albania**, only 8 per cent of women succeed in obtaining bank loans, and many applications are denied.[158] This may be related to norms around land ownership and inheritance. Property is commonly registered under the "head" of the household, a role reserved for Albanian men. Similarly, in **Georgia**, the lack of financial capital due to a low level of property and asset ownership is a barrier to women starting businesses. Without property as collateral, women's chances of receiving loans are greatly diminished. The situation is similar in **Montenegro**, where women own only 4 per cent of houses, 8 per cent of land and 14 per cent of holiday homes, which can be used as collateral for business bank loans.[159] In **Bosnia and Herzegovina**, many women are unable to meet tightened bank requirements for granting credit.

[157] Gaia Montelatici, Impact Hub Belgrade, in conversation with the author

[158] Mimoza Bezhani, 2011, "SEED Working Paper No. 21: Women Entrepreneurs in Albania", International Labour Organization, available at https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_113761.pdf

[159] Montenegrin Employers' Federation, 2017, "Žene u menadžmentu u Crnoj Gori", available at https://www.poslodavci.org/biblioteka/dokumenta-upcg/izvjestaj-zene-u-menadzmentu-u-crnoj-gori

Promoting gender equality in innovation

EQUALS-EU is a three-year project to promote gender equity in social innovation. Specifically, it encourages women to thrive as investors, entrepreneurs, executives, board members and decision-makers. It brings together a consortium of grassroots organizations, academic institutions, charitable foundations, incubators, start-ups, technology enterprises, government agencies and international and advocacy organizations focused on women in the digital world.

Specific activities include innovation camps and hackathons focused on digital inclusion, with a focus on sustainable gender equity practices; high-level seminars in conjunction with existing United Nations and European Union flagship initiatives, including the World Summit on the Information Society Forum, the Generation Equality Forum, the Women in Digital policy, International Girls in ICT Day and the European Development Days; online and face-to-face mentoring, training and advocacy meetings to promote social impact and sustainability, hosted by an advisory group of successful male and female social entrepreneurs and advocates; international academic cooperation, including the development of joint international summer schools, digital learning materials and tools to promote research collaboration, student mobility and work placements; connecting girls and women in ICT and business with female and male role models, including from the EQUALS Global Partnership, the World Wide Web Foundation, Plan International and former winners of the European Union Prize for Women Innovators.

Accelerators, incubators and other start-up resources

"We've found that women [founders] behave very differently than men; for example, they dislike the showmanship, the exaggeration and excessive self-confidence of many men."

- *Alice Deissner, Vodafone Institute, who works with founders from the Western Balkans*

Accelerators, incubators and other start-up programmes offer invaluable assistance, particularly to first time founders new to the start-up scene. They help founders refine their pitch and their products, identify their markets and increase their network of mentors and potential investors. A number of start-up initiatives have been established in the region, including the Techboost programme and a venture fund launched by the European Bank for Reconstruction and Development.[160] While it is out of the scope of this report to survey all start-up programmes and resources by country, a select few that focus on women founders are discussed below.

In **Serbia**, Impact Hub offers mentorship, business development and access to an online community of women founders. In **Albania**, the Women Founders Network established the first

[160] Francesco Cracolici, 2020,"The startup ecosystem in the Western Balkan region: An overview", available at https://medium.com/@francescocracolici/the-startup-ecosystem-in-the-western-balkan-region-an-overview-362dfd153450

all-female accelerator in the Western Balkans. In **North Macedonia**, a bootcamp for first-time women entrepreneurs was launched as an outgrowth of the Womenpreneur Stories initiative to celebrate successful businesswomen. While it is too early to determine their impact, the increase in programmes for women founders is a testament to their growing numbers, as well as an acknowledgement of the challenges that they face within male-dominated founder and investor communities.

In the wake of the COVID-19 pandemic, more resources may be available to start-up founders, regardless of gender, nationality or location. Major technology conferences have moved online, investors are open to pitches through Zoom, and accelerators – including women-only programmes – have moved to remote platforms. While it remains to be seen whether these forums lead to successful investment, collaboration and mentorship, barriers to access for small, remote or underfunded start-ups in economically disadvantaged countries have decreased.

4.3 Recommendations and best practices

Recommendation: Collect precise gender-disaggregated data within the ICT industry

#gender_disaggregated_data #research

Key actors: governments (national statistics offices), private sector (technology companies)

As noted throughout this report, accurate data on women working in ICT are difficult to obtain, and figures often differ between sources. The lack of standardization complicates accurate comparisons between counties. In **Moldova**, for example, data on the ICT industry include communication jobs such as postal carriers, while in **Albania**, statistics include call centres, which provide low skilled, non-technical jobs dominated by women. Furthermore, many jobs in the ICT sector require business or marketing experience, as opposed to technical expertise. The collection of more granular, gender-disaggregated data is necessary to gain an accurate understanding of women working in the field. This includes differentiating between women technologists and others who occupy non-technical roles within ICT.

International best practice

For a comprehensive assessment of gender equality in the ICT industry, the Women in Technology Leadership Round Table Metrics Working Group recommends examining both stationary metrics (e.g. female hires relative to all hires, or percentage of women at different organizational levels) and flow metrics (e.g. women promoted relative to all promotions, or attrition rates among women and men).[161] While detailed, granular data may not be available through global public data sources, individual companies can collect such data in their administrative records.

Recommendation: Institute gender-sensitive recruiting efforts to encourage more women applicants in ICT companies

#recruiting #mentorship #selection_committees

Key actors: private sector (ICT companies), academia

[161] EQUALS, 2019, "Taking stock: Data and evidence on gender equality in digital access, skills, and leadership", available at https://www.itu.int/en/action/gender-equality/Documents/EQUALS%20Research%20Report%202019.pdf

All eight counties profiled in this report suffer from a shortage of ICT talent. To improve the pipeline of qualified employees, companies must actively recruit women applicants. One strategy is to offer internships for female STEM students and provide them with women mentors. Another approach is to showcase the achievements of successful women in the company, including through opportunities for female employees to present at universities, technology training programmes and job fairs. This has the dual benefit of creating prestige for employees and inspiring women candidates to apply. Lastly, women managers or employees should be involved in the recruitment process and should participate in gender-balanced selection committees. This is key, as female hiring managers tend to hire more female employees, particularly for management positions.[162] Where appropriate, candidates with the right profile and skills but without the specific technical skills can be trained on the job.

Country-level best practices

In **Georgia,** TBC is the largest banking group, serving around 83 per cent of the population. One decade ago, TBC made a concerted effort to recruit women, doubling the number of women working in its technology departments from 22 per cent in 2011 to 44 per cent in 2019. To achieve this, the bank recruited highly motivated individuals and trained them on site, rather than recruiting individuals from traditional technical backgrounds. Currently, over 65 per cent of the bank's employees are women, and the share of women who hold senior roles is 36 per cent.[163]

Recommendation: Offer company benefits to address work-life imbalances

#work_life_balance #parental_leave #childcare

Key actors: governments, private sector (ICT companies, larger start-ups)

Typical benefits in ICT companies focus on lifestyle or entertainment (e.g. gym memberships) and are targeted towards stereotypical technology employees, namely young, single men. A shift towards benefits that focus on improving employees' work-life balance – such as in-house or at-home childcare, or generous parental leave – can serve as powerful recruiting and retention tools for women candidates. Companies can also facilitate a positive work-life balance for women by encouraging men to participate in family and childcare responsibilities. Paid paternity leave is one example of such a policy. In fact, generous family leave has been shown to improve employee retention, increase productivity and bolster loyalty and morale. Offering paternity leave also renders male and female IT candidates more equal in the eyes of recruiters.

Country-level best practices

Intelius – one of **Ukraine**'s largest IT companies – provides comprehensive benefits for families, including baby essentials for employees with new-borns and classes and educational tours to teach older children about technology. Children are welcome in the office, where on-site day-care facilities are equipped with toys, books and games, and a childcare worker supervises small children. The company also made efforts to ensure that the office space was child-friendly,

[162] Sue Duke, 2017, "The key to closing the gender gap? Putting more women in charge", World Economic Forum, available at https://www.weforum.org/agenda/2017/11/women-leaders-key-to-workplace-equality/?zd_source=hrt&zd_campaign=5177&zd_term=chiradeepbasumallick

[163] TBC Bank, 2018, "Management report and financial statements 2018", available at https://www.tbcbank.ge/web/documents/10184/253595/JSC+2018.pdf/5f569f53-1c1a-401f-8bda-4128ef2128e9

such as by refitting windows for safety. Lastly, study spaces are available for older children to do their homework on site.[164]

In **North Macedonia**, some IT companies offer on-demand at-home babysitting, as employees work evenings or odd hours with clients in different time zones. In **Georgia**, a start-up offering on-demand nanny and tutoring services works with companies to include their vouchers in the company's remuneration package.[165] In the post-pandemic, remote-work world, such benefits are likely to become more common.

Paternity leave was recently introduced in **Bosnia and Herzegovina**; if the mother decides to return to full-time work before her entitled amount of leave expires, the father can work part-time hours instead.[166] In **Moldova**, the Labour Code allows both parents to take childcare leave for up to three years; however, data show that only a small percentage of Moldovan men receive this childcare allowance.[167]

Regional best practices

The Expanding Choices initiative was launched in October 2020 by the United Nations Population Fund (UNFPA) to bring together representatives of the public and private sectors in the Western Balkans and Moldova to discuss the promotion of family-friendly workplace policies. Companies selected to take part in the programme will launch new policies, including flexible work schedules, employee health programmes, breastfeeding facilities and rest rooms for children on company premises.

Recommendation: Offer flexible professional development programmes

#training #career_advancement #work_life_balance #mentorship

Key actors: private sector (ICT companies, larger start-ups)

ICT companies should ensure that all employees have access to relevant training and certification programmes. This not only benefits the company, making it more competitive, but it improves individual employees' chances for career advancement. Larger, better resourced companies can provide funded training and certification courses (this is less realistic for smaller companies or start-ups). Courses can either be conducted within the timeframe and scope of a regular workday or they can be flexible and on demand, thereby accommodating differing schedules and family responsibilities. Training flexibility would ensure that larger numbers of women keep their skills up to date and remain competitive with a view to advancing to senior positions. Mentorship programmes and women's support groups are also key to encourage professional advancement and retention, particularly in male-dominated environments.

Recommendation: Use data-driven guidelines to integrate gender equality into company culture

#data #accountability

[164] Interview with Roman Hapachylo, Vice-President of Talent Management at Intellias, at the HeForShe Congress 2020 in Ukraine. Video available at https://youtu.be/RrPcbfJ6ySk

[165] Nino Davidze, founder of "MyNanny", Georgia, in conversation with the author

[166] Globalization Partners, "Bosnia and Herzegovina – Employer of Record", available at https://www.globalization-partners.com/globalpedia/bosnia-employer-of-record/

[167] United Nations Moldova, 2020, "Fathers on childcare leave: A practice that is beginning to spread in Moldova", available at https://moldova.un.org/en/50903-fathers-childcare-leave-practice-beginning-spread-moldova

Key actors: governments, private sector (ICT companies, larger start-ups), United Nations

Companies should make public commitments to gender equality, along with data-driven metrics to ensure that they achieve results. One tool for encouraging gender equality in the workplace is the Women's Empowerment Principles, developed through partnership between UN Women and the United Nations Global Compact. The principles offer practical guidance to businesses and the private sector on integrating gender equality into the workplace. ICT companies who are signatories to these principles in the Balkan and Eastern Partnership countries profiled in this report have developed gender-sensitive practices, from revising sexual harassment policies to developing programmes for underserved women. As the ICT field is already data-driven, signatories can integrate Principle 7 on measuring and publicly reporting on progress to achieve gender equality.

International best practice

Accenture – a signatory to the Women's Empowerment Principles – is a global professional services company focused on digital, cloud and security services that believes that gender equality is essential for innovation. In 2018, Accenture set two clear and measurable goals for itself: to achieve a gender-balanced workforce by 2025 and to grow the percentage of women managing directors to at least 25 per cent by 2020. The chief executive officer of Accenture is a woman, and more than 40 per cent of its global workforce are women. In 2017, women comprised 45 per cent of new hires, 32 per cent of promotions to managing director level and 21 per cent of managing directors. Additionally, Accenture publishes workforce demographics across key geographies to measure progress and hold itself accountable.[168]

Women's Empowerment Principles

- Principle 1: Establish high-level corporate leadership for gender equality
- Principle 2: Treat all women and men fairly at work, and respect and support human rights and non-discrimination
- Principle 3: Ensure the health, safety and well-being of all women and men workers
- Principle 4: Promote education, training and professional development for women
- Principle 5: Implement enterprise development, supply chain and marketing practices that empower women
- Principle 6: Promote equality through community initiatives and advocacy
- Principle 7: Measure and publicly report on progress to achieve gender equality

Recommendation: Upskill and retrain women to work in ICT

#retraining #upskilling

Key actors: governments, private sector, NGOs and public sector, United Nations

The COVID-19 pandemic is generating huge retraining and upskilling needs, and those with the required skills will be the engine that fuels national economic recovery. Women who live

[168] Ellyn Shook and Julie Sweet, 2018, "When she rises, we all rise", Accenture, available at https://www.accenture.com/_acnmedia/pdf-73/accenture-when-she-rises-we-all-rise.pdf

in the eight profiled countries disproportionately work in insecure, lower-paid, part-time and informal employment, with less income security and social protection. Lost jobs, for example in the travel, leisure and entertainment sectors, may take years to return, if ever. Retraining and upskilling women for technical positions will not only help ease talent and labour shortages in ICT, but it will provide women with income-generation opportunities in some of the most in-demand and high-paying fields.

Country-level best practices

In **Moldova**, a national IT training programme for women was launched in 2019, implemented by the National Association of ICT Companies (ATIC) with support from the Government of Sweden and UN Women.[169] The programme is open to 500 girls and women across the country, especially to those from rural areas and ethnic and/or other vulnerable groups. The courses will be held online and can be accessed for free.

Participants can focus on front-end development, software testing or digital skills.

In **Georgia**, an upskilling programme on coding, web development and social media marketing was shown to increase young women's economic security.[170] Working in conjunction with UN Women, Google's Women Techmakers Programme, FabLab (a digital training centre) and Georgian universities, the programme matched young women aged 18-35 years with IT instructors. The women received training, followed by paid and unpaid internships in leading Georgian companies. While approximately 45 per cent of beneficiaries did not have a stable income at the start of the project, by the end a number were offered jobs with their employers, some became freelancers collaborating with the employers and others continued their internships with the same or different companies with the potential of later employment. Overall, 42 per cent said that their income had increased as a result of participating in the project, and 63 per cent of participants found new employment through their involvement in the project. One trainee who owned her own business reported that her income had tripled since learning how to conduct social media campaigns.

Recommendation: Support gender-sensitive start-up investing, including women investing in women

#angelinvestment

Key actors: private sector (venture capital, accelerators), international organizations, United Nations

Just as accelerators provide support and resources to start-up founders, so should support be offered to encourage diverse investors, both as business angels and in the venture capital context. One hurdle is overcoming the stereotype of angels as "extremely wealthy males". For example, by pooling money together, even smaller investments can make a big difference to early-stage start-ups. Studies have shown that women investors are more likely to fund other women. In fact, according to an investment simulation by the Wharton School at the University

[169] Svetlana Andries, UN Women Moldova, in conversation with the author
[170] Innovative Education Foundation, 2019, "Increasing young women's income generation opportunities through coding and digital skills development and follow-up support in Georgia", internal report

of Pennsylvania, "assigning [just] 1 per cent more female players to the investor role resulted in lowering the gender gap in start-up funding by 272 per cent."[171]

Country-level best practices

In **Serbia**, a "business angel" group for professional women was formed as part of Impact Hub Belgrade. In addition to teaching women about investment mechanisms, the group connects Serbian angels to experienced investors from international markets. Not only does this expand networks for start-ups and angels alike and help them learn from more knowledgeable counterparts, but it also leads to better deal flows and expands market opportunities.[172]

Government-sponsored innovation funding can also address investment gaps. In 2019, **North Macedonia** established a new venture fund of EUR 10 million, financed by the European Union and the World Bank and managed by the Macedonian Fund for Innovation and Technology Development (FITD).[173] Mandated to invest in early-stage start-ups, accelerators and other innovative programs, the fund includes gender equality as part of its corporate priorities. Programming fosters women's entrepreneurship and productivity through the acquisition of relevant STEM skills.

International best practice

EQUALS has launched the Gender Equitable Investment in Tech (GEIT) programme to systematically address diversity and inclusion in investing.[174] The programme supports investors, including asset owners, managers and sovereign wealth funds, in reducing the investment gender gap. The group has produced an action roadmap and a community of practice within the framework of the Women's Empowerment Principles. Potential future plans include creating a multilateral stakeholder roadmap and joining together to form a global innovation or investment council, under the aegis of the United Nations, to ensure coordinated collective action.

5 Darkside of digital

Digital technology is a double-edged sword for gender equality. One the one hand, it has the potential to transform women's and girls' lives; social media, for example, has created new spaces for women to connect, support each other and

mobilize internationally. However, the same digital platforms have also been weaponized through technology-facilitated violence against women and girls, including in the form of cyberstalking, cyberharassment and trolling, revenge porn, and deep fakes/manipulated media. Research by a reputable digital marketing company ranks Pornhub, a user-generated content

[171] Valentina Assenova and Ethan R. Mollick, 2019, "This is not a game: Massive simulation experiments on entrepreneurial gender bias", available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3305349#:~:text=We%20found%20that%20assigning%20one,to%20reducing%20entrepreneurial%20gender%20bias

[172] Gaia Montelatici, Impact Hub Belgrade, in conversation with the author

[173] INNOV8CBC, "The Fund for Innovation and Technological Development from Macedonia - FITD (CoPartner 1)", available at https://www.innov8cbc.com/fund-innovation-and-technological-development-macedonia-fitd-copartner-1#:~:text=The%20focus%20of%20FITD%20is,technology%20among%20companies%2C%20as%20well

[174] EQUALS Leadership Coalition, 2019, "Money matters: Tackling the gender gap in technology investment", available at https://www.equals.org/post/2018/12/23/money-matters-tackling-the-gender-gap-in-technology-investment

site, as the third most influential technology company after Facebook and Google.[175] Advances in artificial intelligence have enabled new forms of violence, such as the DeepNude application that can "undress" photos of women with one click.[176] The unregulated nature of the web and of cutting-edge technologies makes them ripe for abuse.

As technology touches every aspect of our lives, it is critical that women play a part in shaping the direction that it takes, both in their ability to freely use online tools and platforms to communicate and consume information without fear of violence or harassment and through their involvement in creating the technology products themselves. While a comprehensive overview of online violence is outside the scope of this report, this section provides a snapshot of the situation and responses to digital violence in the eight counties profiled, as well as examples of tools to effectively address the problem.

5.1 Digital violence against women

Regional situation

Around the world, women and girls disproportionately experience cyberviolence.[177] The Beijing +25 Regional Review in 2019 emphasized the heightened exposure of women and girls to violence in technology-enabled spaces. While there is little to no official data about the prevalence of cyberviolence against women and girls in the countries profiled in this report, according to the European Women's Lobby 9 million girls throughout Europe experienced cyberviolence before the age of 15.[178] Furthermore, in almost all OECD countries, more girls than boys report being targets of harassment or violence through digital media.[179]

Whereas attacks on men tend to focus on their opinions or competence, cyberviolence against women is often of a sexist or sexualized nature.[180] Whether on social media, online forums, messaging applications or other forms of digital communication, cyberviolence is just as easily targeted towards adolescent girls as female journalists, activists or politicians. The common denominator for such violence is that it aims to rob women of their voice, power and agency to express themselves as active digital citizens.

Existing small-scale studies in the region attest to the pervasiveness of cyberviolence among girls and women from all walks of life. According to research by the Autonomous Women's Centre Belgrade, "over half of secondary school girls in **Serbia** have been exposed to online comments of a sexual nature, while almost every tenth of them [sic] experienced having their photos or videos published online by someone that they sent these materials to privately. Over half of secondary school boys were, on the other hand, exposed to online threats of physical

[175] Diggity Marketing, "The tech companies that have had the biggest impact on society in the 21st century", available at https://diggitymarketing.com/most-influential-tech-companies-2020/

[176] Samantha Cole, 2019, "This horrifying app undresses a photo of any woman with a single click", Vice, available at https://www.vice.com/en/article/kzm59x/deepnude-app-creates-fake-nudes-of-any-woman

[177] EIGE, 2017, "Cyber violence against women and girls", available at https://eige.europa.eu/publications/cyber-violence-against-women-and-girls

[178] European Women's Lobby, 2017, "#HerNetHerRights: Resource pack on ending online violence against women and girls in Europe", available at https://www.womenlobby.org/IMG/pdf/hernetherrights_resource_pack_2017_web_version.pdf

[179] OECD, 2019, "Girls are more exposed than boys to cyberbullying", available at https://www.oecd.org/gender/data/girls-are-more-exposed-than-boys-to-cyberbullying.htm

[180] Committee of Ministers, Council of Europe, 2019, "Recommendation CM/Rec(2019)1 of the Committee of Ministers to member States on preventing and combating sexism", available at https://search.coe.int/cm/pages/result_details.aspx?objectid=090000168093b26a

violence, and 15 per cent of them were faced with pressure to watch pornography or participate in acts inspired by pornography."[181]

According to research by the Women's Legal Aid Centre in **Bosnia and Herzegovina**, one in four women has experienced violence online or by SMS.[182] Furthermore, the legal framework prevents survivors of technology-related violence from accessing remedies; police are ill-informed and unsympathetic, there are few legal experts in the field, and initiating a civil lawsuit is cost-prohibitive.[183] In 2017, an initiative to amend the Criminal Code was launched to create a legal framework for penalizing online violence.[184] However, it was ultimately unsuccessful.

A study of children in **Albania** shows that girls are more affected psychologically than boys when exposed to unwanted, harmful content. For example, 76 per cent of girls and 55 per cent of boys reported being upset when exposed to depictions of real violence online, and 4 per cent more girls than boys were fairly or slightly upset when exposed to unwanted sexual content.[185]

In **Georgia**, conversations with more than 20 female politicians revealed that virtually all of them had experienced cyberbullying and threats, which extended to their family members.[186] In **North Macedonia**, after a woman Member of Parliament was attacked online by her own party members, a "group of 100" was organized to defend other women and react instantly in the face of hate speech against women.[187] In **Ukraine**, where cyberspace is rife with abuse, spikes in online violence against women coincide with electoral cycles, political events and highly visible or controversial actions taken by women in the public eye. Women tend to be very harshly critiqued for their physical appearance, intelligence and professional competence.[188]

Despite the fact that all countries profiled in this report are signatories to the Budapest Convention on Cyber Crime, the first international treaty seeking to address Internet and computer crime, none has developed a comprehensive legal framework to address it. Furthermore, the Istanbul Convention – ratified all by countries in this report except for **Moldova** and **Ukraine** – contains provisions relevant to cyberviolence and hate speech against women.[189]

Whereas cyberviolence against women is a continuum of "real life" violence – and the two are often experienced together – criminal justice responses have been inadequate. Lack of legislation or enforcement is related to a "false dichotomy" between online and offline violence which results in law enforcement minimizing the harms of cyberviolence and "constructing victims' experiences as 'incidents' rather than patterns of behaviour over time."[190]

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181 Autonomous Women's Center Belgrade, 2020, "Cyber violence scares girls more than boys", available at https://womenngo.org.rs/en/news/1608-press-release-cyber-violence-scares-girls-more-than-boys

182 *Centar za Pravnu Pomoć Ženama* (Women's Legal Aid Centre) (CPPZ), 2012. Research was conducted on a sample of 2 186 participants.

183 https://www.facebook.com/zenskaposla.ba/?hc_ref=ARTryezQmPHIzpU9cXcdKChdS8FnK2dtqNwr40I_obZiBORLtnpq9BZ22C4qXjZM9N0&fref=nf&__tn__=kC-R

184 Ibid.

185 UNICEF, 2019, "One click away: Children's experience of Internet use in Albania", available at https://www.unicef.org/albania/media/2486/file/one%20click.pdf

186 UN Women Georgia, 2020, "Debate begins about preventing violence against women in politics and elections", available at https://georgia.unwomen.org/en/news/stories/2020/03/debate-begins-about-preventing-violence-against-women-in-politics-and-elections

187 Vesna Ivanovikj, head of UN Women Macedonia, in conversation with the author

188 USAID, 2019, "Online violence against women in politics in Ukraine: An IFES assessment", available at https://www.ifes.org/sites/default/files/online_violence_against_women_in_politics_in_ukraine.pdf

189 For example, the provisions set out in articles 3, 3.b, 33, 34 and 40.

190 EIGE, 2017, "Cyber violence against women and girls", available at https://eige.europa.eu/publications/cyber-violence-against-women-and-girls

Despite the absence of legal frameworks to regulate cyberviolence, all eight countries have programmes to address child online protection and cyberbullying. According to an ITU review of the status of national child online protection programmes, which covered all the countries profiled in this report, activities include a combination of school and community awareness-raising, hotlines to report activities such as the sharing of inappropriate sexual content, and online information-sharing tools for parents and teachers. Whereas the specifics of country-level policies can be found in an existing ITU review, neither the national programming and policies, nor the ITU assessment, explicitly incorporated a gender perspective.[191] In other words, the emphasis on child protection does not overtly acknowledge differences in the online experiences of girls and boys.

The prevalence of online violence is particularly worrisome in the context of COVID-19, the first "pandemic of the social media age", as many essential services have migrated online, including help and support related to gender-based violence. For example, according to the Future of Equality report carried out as part of a virtual consultation on Generation Equality in the Western Balkans and Turkey, promoting safe online access is critical in situations where mobility is reduced, such as COVID-19 lockdowns, and for vulnerable groups, including Roma women, who are most in need of online consultations.[192]

At the same time, digital violence throughout the Balkan and the Eastern Partnership countries profiled in this report is likely increasing – as it is everywhere around the world – as people spend more time at home and online. In addition to the "shadow pandemic" of domestic violence that occurred during COVID-19 lockdowns, new forms of online violence, such as "Zoom-bombing", emerged worldwide, and existing sites such as online pornography websites experienced a surge of traffic.[193] In the context of pandemic recovery, more efforts must be made to systematically track cyberviolence incidents and to use such data as leverage to strengthen legal protections.

Using technology to fight violence against women

This report does not purport to cover all the ways in which technology is being used to promote gender equality in the Western Balkans and in Eastern Partnership countries. One area worth mentioning, however, is how technology is being used to end violence against women and help survivors seek support and redress. In the context of COVID-19 lockdowns, for instance, women suffering from domestic violence found themselves at home with their abusers with nowhere to go. In response, UN Women offices in **Albania**, **Georgia**, **Serbia,** and **Montenegro** developed or activated mobile applications to help women access support services. In addition to providing educational information, such applications offer an instant, discreet and confidential way to summon help, whether from trusted contacts or local or national helplines. For example in **Georgia**, the application, created in cooperation with the emergency services, contains a silent SOS button to inform the police about incidents. In **Serbia**, the application is disguised as a music application so that abusers will not notice it on their partner's phone.

[191] ITU, 2020, "Status of national online children protection ecosystems in South Eastern Europe", available at https://www.itu.int/pub/D-STR-COP_ECO_SYS.01

[192] Generation Equality, 2020, "Future of equality: She talks #1 report", available at https://www.wecf.org/wp-content/uploads/2020/10/09102020_SheTalksI-_Future-of-Equality_-Report.pdf

[193] UN Women, 2020, "Online and ICT facilitated violence against women and girls during COVID-19", available at https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/brief-online-and-ict-facilitated-violence-against-women-and-girls-during-covid-19-en.pdf?la=en&vs=2519

The creation of such applications is also an example of the importance of girls' and women's involvement in technology. In **Albania**, for example, the GjejZâ, or "Find Your Voice", application was developed by three adolescent girls who learned to code as part of a United States embassy programme. Recognizing the huge scope of the problem – in Albania, one in two women is said to suffer from violence – and seeing how it manifests early on, the girls used their newfound coding skills to tackle it.

The launch of the local "Be safe" application in **Montenegro** during the COVID-19 pandemic generated huge interest and was downloaded more than 5 000 times in a country with a population of fewer than 700 000. It also triggered an important debate about privacy and how data could be misused; for example, advocates worried that the geolocation feature of the application could be used by perpetrators of violence to track and harm women. In response, UN Women removed this feature and simplified the application so that its main value was to enable women to contact help discreetly.[194] Without women in decision-making positions, the need for such an application might not have been recognized in the first place, and even well-intentioned products and services could have been misused.

5.2 Best practices and recommendations

1) Recommendation: Build on existing national programmes for online child safety to include gender-sensitive approaches

#online_protection_guidlines

Key actors: governments, law enforcement, NGOs

Whereas all countries in this report have programmes and policies in place to address online safety for children, gender issues do not appear integral to their strategies. Taking a gender-blind approach is ineffective in the face of evidence suggesting that online violence is experienced differently by girls and boys. For example, according to the Internet Watch Foundation, 96 per cent of victims of live-streaming of child sex abuse are girls.[195] In light of increased online activity during the COVID-19 pandemic, countries should build on existing national programmes in the area of child safety and should include modules to address cyberviolence against women and girls. Existing hotlines for cyberbullying and child online protection can be expanded to address gendered cyberviolence.

International best practices

ITU recently adopted new Child Online Protection Guidelines, which include gender-sensitive recommendations. These include dedicated and comprehensive guidance aimed at parents, educators, policy-makers and industry, as well as specific resources for children themselves. While the guidelines are currently available in the six main United Nations languages, they could be adopted by local United Nations offices or by NGOs.

[194] Kaca Djurickovic, UNDP gender programme officer, Montenegro, in conversation with the author

[195] Internet Watch Foundation, 2018, "Trends in online child sexual exploitation: Examining the distribution of captures of live-streamed child sexual abuse", available at https://www.iwf.org.uk/sites/default/files/inline-files/Distribution%20of%20Captures%20of%20Live-streamed%20Child%20Sexual%20Abuse%20FINAL.pdf

2) Recommendation: Reform legal frameworks and codes of conduct to address digital violence

#legal_reform #continuum_of_violence #codes_of_conduct

Key actors: governments, law enforcement, international organizations (United Nations, INTERPOL), NGOs

A comprehensive legal reform agenda must be broad-based to maximize reach and impact, including information and communication laws to regulate content; data protection and privacy laws; human rights and constitutional laws concerning freedom of expression/speech; and criminal law, for example addressing violence, terrorism and cyberbullying.[196] Furthermore, there must be clear codes of conduct for police and law enforcement officers to understand and address online violence from a human rights and gender approach.

National criminal codes must be harmonized with international conventions, such as the Istanbul Convention, which has been ratified by six of the eight countries profiled in this report. Mechanisms to systematically collect data on the prevalence of such crimes – including the continuum between online and offline violence – are important tools for lobbying governments.

Country-level best practices

In **Moldova,** UN Women piloted the use of augmented and virtual reality as a tool to train police officers and others on protocols for addressing violence against women.[197] Through the creation of an application to simulate real-life situations (e.g. serving as a first responder to a domestic violence call), they created a space for police officers to practise their responses in simulated situations without real-world consequences. Through the use of virtual environments, officers could receive feedback and improve their behaviour to act more quickly and effectively and with more empathy. The application can be distributed to any number of users, who need only a mobile phone to experience the training scenarios.

3) Train women and girls on digital safety

#online_safety #privacy #digital_footprint

Key actors: NGOs, academia/schools

In the absence of robust safety measures or legal programmes for redress, women and girls must themselves be trained about online safety. Key topics include privacy and anonymity, digital footprint, encryption, use of data, terms of service on applications and social media platforms, and understanding digital rights.

[196] United Nations Broadband Commission for Digital Development Working Group on Broadband and Gender, 2015, "Cyber violence against women and girls: A world-wide wake-up call", available at https://www.unwomen.org/~/media/headquarters/attachments/sections/library/publications/2015/cyber_violence_gender%20report.pdf?v=1&d=20150924T154259

[197] UN Women Moldova, 2018, "UN Women Moldova tests virtual reality tools to end violence against women", available at https://moldova.unwomen.org/en/noutati-si-evenimente/noutati/2018/04/realitatea-virtuala-pentru-eliminarea-violentei

Country-level best practices

In **Bosnia and Herzegovina**, a model regional initiative, known as Women Rock IT, was developed by OneWorld Platform for Southeast Europe.[198] The first training programme of its kind in the region, the initiative brought together women from **Bosnia and Herzegovina**, **Serbia**, **Croatia**, **North Macedonia** and **Montenegro** to learn about women's rights and digital safety. The goal of the training was to present security mechanisms, highlight the importance of Internet privacy and analyse online violence against women in the region.

In **Serbia**, the Autonomous Women's Centre Belgrade is conducting a multi-year campaign to end online gender-based violence in youth intimate partner relationships. Working with secondary school students and teachers, the goal of the "I can say no - Love is not violence" project is to mobilize youth and empower girls to stand up for themselves. Activities address ways in which technology accelerates controlling and abusive behaviour, how girls can protect themselves, and strategies and tools for denouncing digital violence and supporting those who experience it.

6 Conclusion

Much has changed in the world in the 25 years since the adoption of the 1995 Beijing Declaration and Platform for Action. Rapid digital change and the fourth industrial revolution are revolutionizing the way in which people live and work. The COVID-19 pandemic radically accelerated this trend, pushing individuals to rely on digital technologies in every aspect of their lives.

The eight countries profiled in this report are well poised to take advantage of the new digital economy and use it as an engine of economic growth. Their assets include strong access to technology among both men and women, populations with strong academic foundations in mathematics and science and relatively high numbers of female university graduates in STEM-related fields.

Many of their economic challenges, from brain drain to a lack of qualified technical talent, could be addressed through empowering girls and women to work in technology-related fields. Yet the number of women working in ICT industries, founding or investing in technology start-ups or serving as high-level managers or directors in technology companies remains remarkably low across all eight countries. Challenges including cultural norms and biases, lack of self-confidence and online and offline harassment hinder girls' and women's full participation in digital life.

At the same time, the COVID-19 pandemic represents an historic opportunity to transform women's and girls' involvement in technology in the region. Well before the pandemic hit, demand for digital skills was already prompting curriculum overhauls in education systems across Eastern Partnership and Western Balkan countries. Whereas schools across all eight countries are evolving by incorporating digital literacy and twenty-first century skill-building into coursework, education ministries are not doing enough to ensure that girls equally benefit.

[198] Flavia Fascendini, 2020, "Women changing practices on digital safety in Bosnia and Herzegovina", Association for Progressive Communications, available at https://www.apc.org/en/news/women-changing-practices-digital-safety-bosnia-and

Furthermore, formal educational reforms are slow. The onset of COVID-19 exposed weaknesses within school systems, from a lack of digitally competent teachers to gendered differences in access to devices and technology platforms. The pandemic also spotlighted ways in which gendered digital divides are compounded by urban-rural and socio-economic divides. More work must be done both to integrate digital competence and literacy into classrooms and to provide gender-sensitive STEM learning environments, both online and offline.

In the absence of culturally relevant, gender-sensitive STEM curricula in schools, enrichment programmes for girls play a critical role in the region. In the context of online and hybrid learning formats used during the COVID-19 pandemic, opportunities exist to "democratize" extracurricular programmes and make them accessible to larger, more diverse audiences. Wherever possible, cooperation with national educational systems can help expand the reach of such programmes and ensure the participation of girls from rural, remote and underserved populations. Partnerships with technology companies through internships, work shadowing or the like are also critical to expose girls to real-world professional environments.

Even as formal and informal STEM education systems evolve, the ICT industry in all eight countries is suffering from a shortage of qualified talent. Ineffective teaching methods lead to a mismatch between academic skills and real-world industry needs. This has particular implications for women, who are less likely to apply for high-tech positions without practical experience and knowledge. Investigating and fixing this "leaky pipeline" is key both to increasing gender equality in the field and growing national economies.

Changing work norms in the wake of the COVID-19 pandemic also represent an important opportunity, as providing the flexibility to work from home as part of a package of benefits promoting work-life balance is a critical strategy for attracting talented women. Concerted efforts to focus on women's professional development and integrate gender equality principles into company cultures are powerful ways to retain women in the long term.

The COVID-19 pandemic also represents a key opportunity to offer new job possibilities to women affected by downsizing and unemployment. A variety of ICT upskilling and retraining models are explored in this report, from programmes carried out in cooperation with technology companies that guarantee future internships or jobs, to technical schools that offer conditional delayed tuition payments when and if participants find a high-paying job. Regionwide, governments will need to redouble such efforts to boost stability, employability and prosperity.

Increasing the number of women working in ICT also has important implications for the kind of technology products and services that are being created. As demonstrated in this report, technology can be used as a powerful tool to promote gender equality, such as through mobile applications to aid survivors of domestic violence or virtual reality tools to train law enforcement officers on gender-sensitive codes of conduct. Women's involvement is critical to recognizing such problems in the first place and understanding how to address them in responsible ways, for example by ensuring that applications for domestic violence survivors do not hurt users by exposing sensitive data.

The collection and use of sex-disaggregated data and indicators is a recurring theme throughout this report. This involves the standardization of definitions, for example by providing greater precision when categorizing "girls and women in STEM" or "women working in ICT". It also necessitates a refinement in data collection, for instance by highlighting intersectional digital gender divides when measuring access to technology. Only in this way will schools, businesses,

governments and other stakeholders gain a true understanding of digital gender gaps and how to fix them.

As the issues discussed in this report are complex and multifaceted, they can be tackled only through cooperation between multiple stakeholders, including governments, academia and the public and private sectors. Regional frameworks highlighted in this report, such as the Digital Agenda for the Western Balkans and the EU4Digital programme, are key for pooling resources and sharing knowledge. In fact, according to a report on the Western Balkans developed as part of the Generation Equality campaign, technology and innovation represent the "greatest opportunity" to quickly advance gender equality in the region, and emphasis on women in technology should be integral to regional women's movements.[199]

In addition, international frameworks, such as the Generation Equality campaign and EQUALS Global Partnership, are bringing together coalitions of governments, civil society, the private sector and others to address highlighted issues. For example, the Technology and Innovation Action Committee of the Generation Equality campaign has been formed to catalyse collective action and deliver concrete results on gender equality in technology at national, regional and global levels.

While there is a long way to go, the situation in the Western Balkans and in Eastern Partnership States is slowly changing. Whereas families and educators may have discouraged girls from entering technical careers in the past, there is increasing recognition of new technologies as lucrative career paths. In many of the countries profiled in this report, ICT jobs pay between two and eight times more than the average national salary. Furthermore, gaps in women studying and working in technology continue to close as more women are attracted to the prospect of higher salaries in secure, yet flexible, companies. Economic instability brought about by the COVID-19 pandemic will only increase the general attractiveness of such careers. Now is the time to take bold steps to ensure that girls and young women enjoy the full fruits of the digital revolution, both now and in the future.

[199] Generation Equality, 2020, "Future of equality: She talks #1 report", available at https://www.wecf.org/wp-content/uploads/2020/10/09102020_SheTalksI-_Future-of-Equality_-Report.pdf

Annex: Country profiles with overview of main ICT indicators

1. Country profile: Albania	
Industry background	**Albanian ICT industry** The ICT industry in Albania is a dynamic and growing sector that has taken important leaps in recent years. The ICT sector is one of the main development opportunities for business in Albania. ICT companies are not only specialized in a particular segment, but often have two or more activities in their portfolio. Albania has a rich legal ICT-related framework in line with European Union standards. However, there is a need to improve e-governance and information society legislation in order to respond to dynamic developments in this field. Albania is facing a number of constraints which hinder industry growth and development.
Women's access to ICT	**Women's access to ICT** The information is available only for basic access to and ownership of ICT. There is slight difference between male and female access to ICT of 3.1 per cent.
Women participation and leadership in the ICT industry	**Women's participation and leadership in ICT** There is a significant difference in digital entrepreneurship between women and men. In general, women are less likely to participate in the labour market. Women are under-represented in both the public and private sectors. Gender quotas have been implemented in practice, resulting in an increase in the number of female Members of Parliament. Currently, 43 of the 140 Members of Parliament are women, and 13 of the 31 deputy ministers are female. Albania allocated funds for 40 women to expand employment and entrepreneurial opportunities. The appointment of the first female general in the Albanian Armed Forces is an evidence of the progress in improving women's participation and decision-making capabilities.

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1. Country profile: Albania	
"Albania has vowed to include more women in decision-making and the labour market since the Global Leaders Meeting."	
Woman and ICT education	**Women in ICT education** Women are significantly under-represented in ICT education, VET and tertiary education. With regard to fields of study, more women than men graduate in the subject areas of business, administration, law, health and well-being, arts and humanities, whereas more men than women graduate in the fields of services, engineering, manufacturing, construction and IT (56.3 per cent). While Albania is one of eight countries that use both European key competence definitions and a national definition, digital competence is not explicitly addressed in the national curriculum. Albania also adopted an education and lifelong learning strategy to improve curricula, create high-content digital materials in the Albanian language and raise awareness among students about how to protection themselves from the dangers of the Internet. Albania is the only exception in terms of agencies with responsibilities for digital education, as it has a specific agency that covers only secondary education.
Good practices	**Good practices in informal ICT education** The **Digital Girls of the Year** initiative aims to increase participation and open doors for girls and young women to study and work in well paid digital jobs. The objective of the project is to create an environment that empowers and encourages girls and young women to consider careers in the growing field of ICT, enabling both girls and technology companies to reap the benefits of greater female participation in the ICT sector in Kosovo, Albania and Macedonia. **IT career opportunities for young women** are growing in line with the global trend aimed at attracting more women to the ICT sector. **Almooc, a website that runs massive open online courses**, offer ICT courses on subjects that are in high demand in the country. More than 42 per cent of the 8 500 trainees who have completed such courses are female. The **Skills for Jobs (SJ4)** pilot project was launched in April 2018 to offer remote internships to ICT students. The project involves ICT businesses, including **11 leading companies** based in Tirana, giving the students practical assignments to be done in the classroom or at home. The project uses the PAPION online platform. **Pavarësia School launched a pilot course in design software for 3D printers** involving 22 VET teachers and students. Equipment and software were provided by a Swiss company operating in Albania and is used to develop the digital skills and competences of students to enable them to meet the demands of modern industry and to create tools.

(continued)

1. Country profile: Albania	
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** In Albania, there is ad hoc coverage of cybersecurity, with limited provision of information and limited reporting on specific issues that individuals face online, such as child online protection and cyberbullying. A sector for cybercrime within the State Police and National Agency for Computer Security has been established. Computer crimes can be reported by type of violation or cybercrime through the sector's website. Albania has also taken steps to prevent and address violence against women and provide strong support for survivors of domestic violence through national shelters, free legal aid, referral mechanisms at the municipal level and a national counselling line for victims of domestic violence.
Stakeholders	**Stakeholders: Policy-makers** The Ministry of Infrastructure and Energy (responsible for ICT infrastructure), the Information Society Unit (under the supervision of the Prime Minister), the Ministry of Finance and Economy (responsible for the business environment), the Ministry of Education, Sports and Youth (responsible for science, academia and youth), the Eurydice Unit, the European Integration and Projects Development Department, the Ministry of Labour, Social Affairs and Equal Opportunities, the Albania Investment Council, the National Council of Higher Education and Science, the Business Consultants Council and the Strategic Planning Council. **Stakeholders: Executive level** The National Agency for Scientific Research and Innovation (AKKSHI), the Electronic and Postal Communications Authority (AKEP), the National Agency for Information Society (AKSHI), the Albanian Investment and Development Agency (AIDA), the Chamber of Commerce and Industry, the Albanian IT Association, the National Agency for Computer Security, the Cybercrime Sector within the State Police, the National Agency for Computer Security (ALCIRT), the National Agency for Computer Security (ALCIRT) and the Albanian Institute of Technology. **Stakeholders: Academia, accelerators, incubators** **Academia:** Canadian Institute of Technology, Albanian University, Epoka University, New York University, University of Tirana, Polytechnic University. **Accelerators, incubators and early programmes:** Ofiçina, Protik, Yunus Social Business, Betahaus, Startup Grind Albania, Metropolitan University Incubator, DutchHub, TAG, Tirana Business Park.

2. Country profile: Bosnia and Herzegovina

Industry background

ICT industry in Bosnia and Herzegovina

The IT industry in Bosnia and Herzegovina has been expanding in recent years. Since 2010, it has achieved a growth level of 72 per cent. During the last few years, IT experts are among the most sought-after professionals.

ICT companies are successfully implementing joint projects with foreign companies of all sizes to develop product components as subcontractors for product development or as implementers of software products. ICT companies in Bosnia and Herzegovina have a rich and diverse experience in providing software development, outsourcing, project management and consulting. They are highly educated (BSc/MSc in software engineering and mathematics), skilled and certified, but, more importantly, they are also battle-tested.

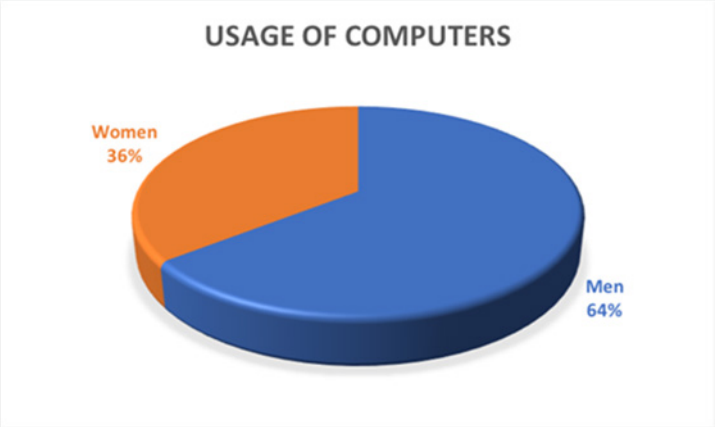
The workforce in the IT industry is quite young, considering that 60-70 per cent of the workforce are 35 years of age or younger.

Women's access to ICT

Women's access to ICT

There are 3 million active Internet users (86 per cent of the total population) and 2.56 million active mobile users (76 per cent of the population). There is a higher rate of computer usage by men than women. Usage also varies among different age groups.

Women use the Internet slightly more, with an insignificant difference between men and women in the 16-24 years age group (98.7 per cent of women compared with 98.6 per cent of men).



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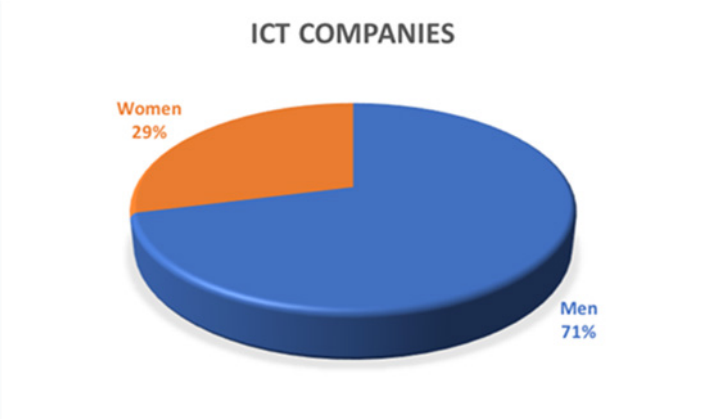
2. Country profile: Bosnia and Herzegovina

Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

The severe inequality of women is evident in the ICT sector and is linked to high gender segregation in educational profiles. Entrepreneurship remains largely undeveloped among women in Bosnia and Herzegovina, due to the general preference for secure, predictable public sector jobs, an averseness to risk-taking and a lack of available support.



Only 10 per cent of start-up entrepreneurs in the IT sector are women. Whether developing mobile applications or websites, women are rarely represented. Only 6 per cent of all employed women are among the highest paid employees, compared with 13 per cent of men. Women are paid 78 per cent of the average male salary in the IT sector. Women tend to avoid managerial positions; only 23.8 per cent of companies in Bosnia and Herzegovina are led by women.

(continued)

2. Country profile: Bosnia and Herzegovina

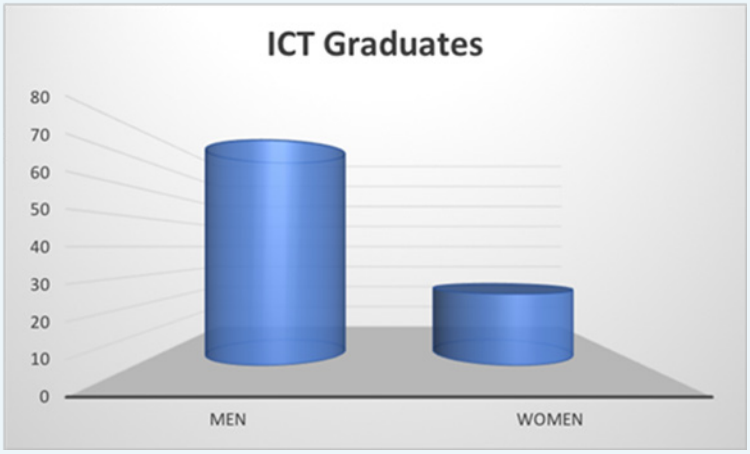
Woman and ICT education

Women in ICT education

Women are significantly under-represented in ICT education, VET and tertiary education.

With regard to fields of study, more women than men graduate in the areas of education, social sciences and art, natural sciences, mathematics, statistics and health, whereas more men than women study engineering, manufacturing, construction and services. There is a clear difference between male and female study fields.

As a result of existing social norms about the traditional role of women, it is highly difficult for most women to break into professional areas considered more suitable for men.



Digital competence is not explicitly addressed in the national curriculum or acknowledged in existing teacher competence frameworks, which implies that there is no guidance from top-level authorities.

Bosnia and Herzegovina is one of six education systems **without a digital education strategy.**

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2.	Country profile: Bosnia and Herzegovina
Good practices	**Good practices in informal ICT education** **IT Girls BiH, #ITGirls initiative, jointly supported by UNICEF, UN Women and UNDP: This joint initiative aims to demystify the ICT industry and encourage girls to pursue a career in ICT**. It closes the gap by addressing the fact that women and girls remain invisible in the ICT sector. **TECH2girls:** This project is being implemented for the first time in Bosnia and Herzegovina with the aim of increasing the number of girls and women between the ages of 18 and 25 years in the ICT sector, e.g. in programming, digital marketing and social media. This project provides free programming workshops, mentoring sessions and other educational content. **Microsoft's DigiGirlz project:** Another example of efforts to increase awareness of the need to direct girls to STEM education. Apart from these gender-specific programmes, there are numerous training and educational programmes to educate young people ages 13 to 17 years. For example, in 2018 the Bit Alliance and its partner organizations organized a free programming camp, **CoderDojo**. By 2017, they had organized 17 free programming camps in 12 cities, with 1 100 attendees in the 13-17 years age bracket. The **ENABLE BiH** project brings STEM education to primary and secondary schools. It aims to introduce practical classes from an early age to prepare for higher STEM education.
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** Domestic laws and international conventions are in force in Bosnia and Herzegovina to protect women's rights. Bosnia and Herzegovina is a signatory to several international agreements, which help provide a framework for developing or amending pertinent domestic legislation to prohibit technology-related violence against women and offer remedies to survivors. The legal framework is full of obstacles that prevent survivors of technology-related violence from accessing legal remedies. There are very few lawyers who deal with Internet rights in the country, and survivors rarely seek justice through civil lawsuits because it is an expensive process. The law does not regulate special protection mechanisms to guarantee the protection of women against violence committee through the use of technology. Bosnia and Herzegovina is part of the global Women Rock IT project to gather evidence on this type of violence, which was developed by the OneWorld Platform for Southeast Europe (OWPSEE).

(continued)

2. Country profile: Bosnia and Herzegovina

Stakeholders

Stakeholders: Policy-makers

The Ministry of Communications and Transport (Federation of Bosnia and Herzegovina/Republic of Srpska), the Ministry of Finance, the Ministry of Education and Culture (Federation of Bosnia and Herzegovina/Republic of Srpska), the Ministry of Labour and Social Affairs (Federation of Bosnia and Herzegovina/Republic of Srpska), the Foreign Investment Promotion Agency of Bosnia and Herzegovina, the Higher Education Development Agency, the Ministry of Education and Science (Federation of Bosnia and Herzegovina/Republic of Srpska), the Foreign Council for Investments and the Ministry of Civil Affairs (Education Sector).

Stakeholders: Executive level

The Chamber of Commerce and Industry of Bosnia and Herzegovina (Federation of Bosnia and Herzegovina/ Republic of Srpska), the IT Agency of the Republic of Srpska (as of 2018), ministries that coordinate on policies on science, research and crafts in 10 cantons, the Communication Regulatory Agency of Bosnia and Herzegovina, the Agency for Small and Medium Enterprises (Republic of Srpska) and the Gender Centre (Federation of Bosnia and Herzegovina/Republic of Srpska).

Stakeholders: Academia, accelerators, incubators

International organization, alliances and non-profits: UN Women, UNDP, UNHCR, Bit Alliance, BH Futures Foundation, Foundation 787, Save the Children Western Balkans.

Academia: University of Sarajevo, University of Mostar, University of Banja Luka, University of Tuzla, University of Zenica, University of Bihac.

Accelerators, incubators and early programmes: Federation of Bosnia and Herzegovina: HUB387 improvised IT park Sarajevo, BIT Centre Tuzla, INTERA Technology Park, Technology Park Zenica; Republic of Srpska: Innovation Centre Banja Luka (ICBL).

3. Country profile: Georgia

Industry background

Georgian ICT industry

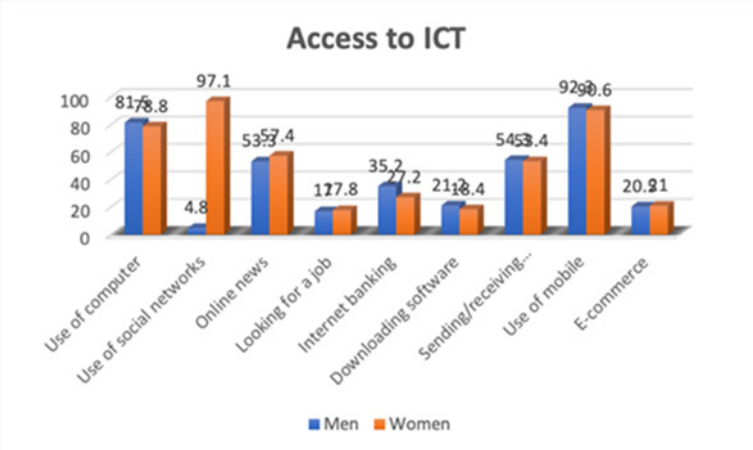
The development of the ICT sector and its efficient integration into the global economy is regarded as one of the cornerstones of Georgia's social and economic development. Technology infrastructure growth has been recorded throughout the country. Internet access and computer usage rates by individuals have reached 80 per cent. Despite the rise in the connectivity, the gap in digital skills, particularly in rural areas, is still evident.

The Government, large companies and several universities have introduced short-track IT and web/mobile development training programmes to leverage the initial supply of qualified IT professionals in the field. Traditional, formal, university-based BA and MA programmes are considered insufficient to match current market needs.

Women's access to ICT

Women's access to ICT

Men are more frequent computer users than women. While women use the Internet more for social networks, reading online news sites/newspapers/news magazines, seeking health-related information, looking for a job or sending job applications, men use the Internet more for Internet banking, downloading software, sending and receiving e-mails, and finding information about goods and services. Men also use mobile phones slightly more than women. Moreover, slightly more men than women own a mobile phone. Men tend to undertake software-related activities more often than women by a difference of 1 per cent. As for e-commerce (buying or ordering goods or services), a slightly higher percentage of women tend to use these services compared with men.



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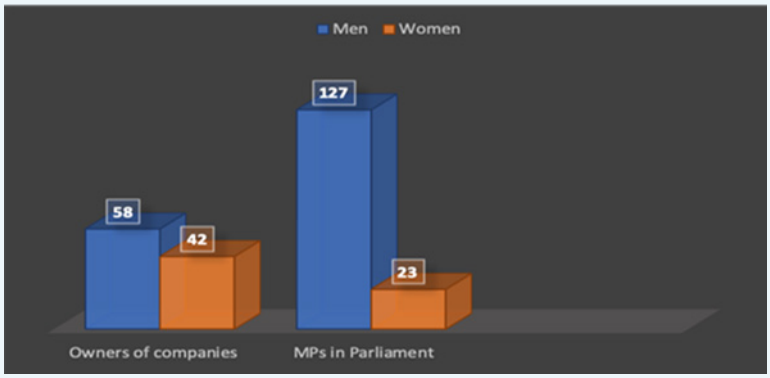
3. Country profile: Georgia

Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

In general, 47 per cent of employees are women and 53 are men. In terms of ownership forms, the number of women who own a company lags behind that for men by 16 per cent. In terms of the size of enterprises, men are also leading by 16 per cent. As for the ICT sector, the wage gender gap is also evident between men and women, with women earning 74 per cent of the average male salary. In 2018, the average salary for women was higher in the electricity, gas, steam and air conditioning sectors, but the remaining areas are still lagging behind. In 2018, there was also a significant difference in ownership of newly established enterprises, with only 29 female owners as opposed to 52 male owners.

Even within female-dominated sectors, women rarely occupy executive, upper management or other decision-making positions and have fewer opportunities for promotion and career advancement. While the number of female parliamentarians has risen from 6.4 per cent in 2008, it was still only 16 per cent in 2017 (a mere 23 of the 150 parliamentary seats), far below the target of at least 30 per cent outlined in the Beijing Platform for Action. Women are also under-represented in local government. In executive branches of the Government in Georgia, women account for only 15.4 per cent of *Sakrebulo* (representative council) members. This figure has remained unchanged since the 2010 elections. In the local government elections held in October 2017, all elected mayors were male.



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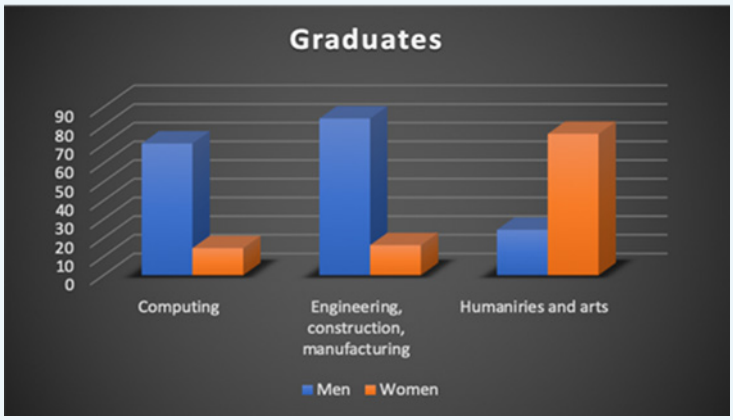
3. Country profile: Georgia	
Woman and ICT education	**Women in ICT education** Women are severely under-represented in ICT education. Only 14.5 per cent of women studying computing graduate, compared with 70.50 per cent of men. A similar imbalance is also evident in engineering, manufacturing and construction, with women representing only 16.1 per cent of graduates. Women are mostly overrepresented in the humanities and arts, seen as typically female professions. The general and widespread lack of access to education and training experienced by Georgian women has several ramifications for their use of ICTs. High rates of illiteracy among Georgian women is the first obstacle to ICT use. Language issues are intensified for women, as they have less time, money and access to allow them to learn English – the dominant language of ICTs – or translate existing information and training documents into French or local languages. Social influences on women's relationship to technology also affect women's attitudes toward ICTs. 
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** In Georgia, current research points to widespread experiences of violence against women across the country. Intimate partner violence, as well as early and forced marriage, are among the most prevalent forms of violence against women in Georgia. These types of violence cut across all divisions of income, culture and class. Despite its scale and socio-economic impact, violence against women remains largely under-reported and under-researched in key areas. Existing administrative data, such as police and criminal justice statistics, paint only a partial picture of the problem. During the past two decades and in the aftermath of the dissolution of the Soviet Union, Georgia has seen considerable progress in advancing the policy and legislative framework around gender equality and violence against women. In 1994, Georgia acceded to the Convention on the Elimination of All Forms of Discrimination against Women, an international instrument for the protection of women's rights, with no reservations. At the 1995 Fourth World Conference on Women in Beijing, Georgia joined other countries in agreeing to develop an action plan to improve the condition of women. In 2017, Georgia ratified the Istanbul Convention and adopted a milestone legal framework aimed at harmonizing its domestic legislation with the convention. In addition, Georgia endorsed the SDGs by nationalizing all 17 goals, including Goal 5 to achieve gender equality and empower all women and girls, including via the elimination of all forms of violence against all women and girls in public and private spheres.

(continued)

3. Country profile: Georgia

Stakeholders

Stakeholders: Policy-makers

The Ministry of Economy and Sustainable Development, the Department of Economic Development, the Ministry of Justice, the Information Technology Department, the National Communications Commission and the Ministry of Education, Science, Culture and Sport.

Stakeholders: Executive level

APC Networks, the National Statistics Office of Georgia, the Georgia Institute of Technology, the Institute of Cybernetics, the Georgian National Communications Commission, the Institute of Control Systems, the ICT Business Council, the Georgian Research and Educational Networking Association (GRENA), the Centre of Innovation for Information Technology, the Technological Start-ups Association and the Women's Business Council.

Stakeholders: Academia, accelerators, incubators

Academia: Out of the 60 higher education institutions in Georgia, the following leading universities provide the key ICT-related programmes and curricula: Ivane Javakhishvili Tbilisi State University/STEM programme, Georgian Technical University, Free University, Caucasus University/Caucasus School of Technology, Ilia State University/STEM programme, Business and Technology University. In addition to higher education institutions, VET centres also offer classes in IT, such as: Opizari, Black Sea, Shota Meskhia University, Mermisi, Prestige, Educational Management Information System, Aisis, Tetnuldi, Modusi, Horisone, Spektri, Phazisi, AkhaliTalga, Iberia, Gldani VET Centre, Akaki Tsereteli State University, Batumi Shota Rustaveli State University, Telavi Jacob Gogebashvili State University and Sokhumi State University.

Accelerators, incubators and early programmes: Tech parks opened in Tbilisi and Zugdidi, 14 Fabrication Laboratories (FabLabs) in vocational education institutions, eight FabLabs in other locations across Georgia, three innovation laboratories (iLabs) and two innovation centres in the regions; Pre-Accelerator Programme Network, Business As Networks, iHub Georgia, Georgian National Cluster Platform, Creative Business Cup (CBC) Georgia, Mioni ICT Cluster.

4. Country profile: Moldova	
Industry background	**Moldavian ICT industry** The IT industry is growing vibrantly and offers plenty of potential. Moldova has a dynamic and competitive telecommunication market that is characterized by high Internet access speed, good mobile services accessibility and technological development. The combination of education, IT skills, location and language makes Moldova ideally suited for organizations looking for a cost-effective alternative to Western, Central and Eastern European locations. The telecommunication authorities are trying to apply best practices for market regulation in order to create a favourable environment for information society development with minimum intervention from the Government. JPMorgan Chase & Co, HSBC, UBS, Barclays Capital, Fujitsu, Ubisoft and Orange are just a few of the marquee customers in the IT industry that have settled in Moldova. The information technology (IT) sector is an economic sector, in which the Republic of Moldova is making significant progress.
Women's access to ICT	**Women's access to ICT** Women and girls occupy only 31 per cent of jobs in the ICT sector and only 19 per cent of digital roles. Only 4.6 per cent of female students in higher education choose STEM subjects as their study profile. As a result, women enter jobs in the ICT with a lower level of qualification and, consequently, remuneration. Women's salaries in the ICT sector are 33 per cent lower than those for men. Access to ICT and the Internet is not equal. The share of households led by women who have a computer and Internet access is 11.7 percentage points lower than that of households led by men. Differences grow with time, with access to computers and the Internet in households led by men growing faster than that in households led by women.

(continued)

4. Country profile: Moldova

Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

On average, women entrepreneurs represent around 34 per cent of the labour market. They represent only 31 per cent of all entrepreneurs, dropping to 20 per cent in the ICT sector. Women occupy only 19 per cent of digital roles. Among young women, entrepreneurship is even lower; only around 16 per cent of young entrepreneurs are women.

Out of the total number of women entrepreneurs, 67 per cent run IT companies, while among male entrepreneurs the rate is 56 per cent.

Women account for only 25-27 per cent of all entrepreneurs in Moldova; the main explanation for this is the very high number of male-owned firms at the micro level, a number that appears to imply a dramatic failure rate among companies started by men. The gender pay gap in IT has reached 33 per cent. Women currently account for 61 per cent of tertiary education graduates, only 4 per cent of whom graduate in STEM. In recent years, the number of women-owned IT businesses has grown faster than those owned by men, which has contributed to the reduction in gender disparities. Between 2015 and 2017, the number of enterprises in the ICT sector run by women increased by 28 per cent, while those run by men increased by 24 per cent. If this trend continues, gender inequalities among ICT entrepreneurs will diminish.

(continued)

4. Country profile: Moldova

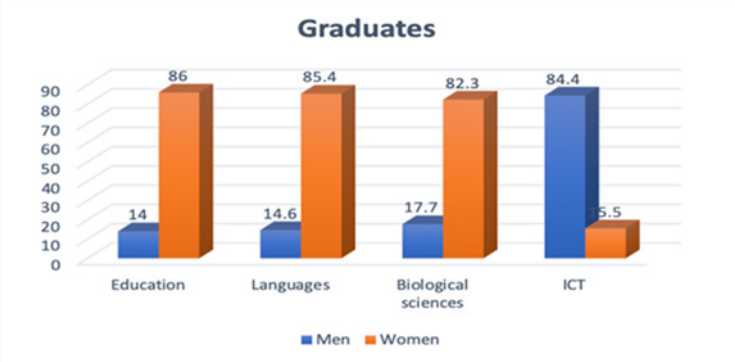
Woman and ICT education

Women in ICT education

Moldova has strong university programmes with specializations in IT and related sciences, and almost 18 educational institutions offer studies in IT-related services. The Ministry of Education, Culture and Research is working to upgrade the ICT curricula and infrastructure in schools and to develop human capital. The proportion of graduates from ICT-related fields (around 6 500 annually) is also higher than in regional peers, such as Bulgaria, Hungary and Romania.

Women are significantly under-represented in ICT education, VET and tertiary education.

Women constituted only 15.5 per cent of all ICT graduates in 2018. Typically, women are more dominant in education and biological sciences.



Good practices

Good practices in informal ICT education

GirlsGoIT: The GirlsGoIT programme was established in March 2015. This led to the establishment of girl-led local clubs in 13 regions in Moldova, such as GirlsGoIT Chisinau. Their mission is to prepare girls for STEM studies and the ICT labour market through internships at ICT companies. TEKEDU is the founding partner of the GirlsGoIT programme, which supports Moldova's national agenda on gender equality, quality education and the provision of decent jobs and employment for women and girls in ICT. The programme organizers received nearly 300 applications for the 100 available places on their summer camp, strengthening their belief in the need to push STEM among young girls in Moldova.

Another initiative to encourage more girls and women to enter STEM education is **Empowering Women in ICT Skills**, implemented by the Moldovan Association of ICT Companies with the support of UN Women Moldova and the financial support of the Swedish Government. The aim of the initiative is to encourage Moldovan girls and women to join IT courses. The **Moldovan Tekwill ICT Excellence Centre** also recognized the need to address the role of women in ICT and encourage them in particular, as women are an under-exploited source of vital talent for the sector. In addition to informal gender-specific training programmes, there is also the STEP IT Academy and Academy+ Moldova.

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4. Country profile: Moldova	
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** Moldova has made a commitment to ensure gender equality. The national authorities have taken a series of actions to that end, including ratifying international conventions and adopting national plans and strategies. Patriarchal attitudes and deeply rooted stereotypes persist regarding the roles and responsibilities of men and women in family and society. Such attitudes and stereotypes are the core drivers behind women's disadvantage in political and public life, violence against women and gender segregation, as reflected in the educational and employment choices of women and girls.
Stakeholders	**Stakeholders: Policy-makers** The Ministry of Economy and Infrastructure, the Ministry of Health, Labour and Social Protection, the Ministry of Education, Culture and Research, the Ministry of Information Technology and Communications, the Ministry of Regional Development and Construction and the National Regulatory Agency for Electronic Communications and Information Technology. **Stakeholders: Executive level** The Moldovan Association of ICT Companies, the Moldovan Investment Agency, the National Bureau of Statistics, the Chamber of Industry and Commerce of the Republic of Moldova, the e-Government Agency, the Moldova Banking Association (ABM), the Association ESI-EE Quality Lab, the Information Society Development Institute (ISDI), the Institute of Mathematics and Computer Science, DNT, the Association of Moldovan Programmers (AIM) and the Association of IT Specialist of Moldova (ITA). **Stakeholders: Academia, accelerators, incubators** **International organizations and NGOs:** Moldova Competitiveness Project, Digital Transformation Centre, Digital Communication Network. **Academia:** 18 educational institutions offer studies in IT-related services, including the Academy of Sciences of Moldova. **Accelerators, incubators and early programmes:** Generator HUB, Intexnauca, Tekwill ICT Excellence Centre.

5. Country profile: Montenegro

Industry background

Montenegrin ICT industry

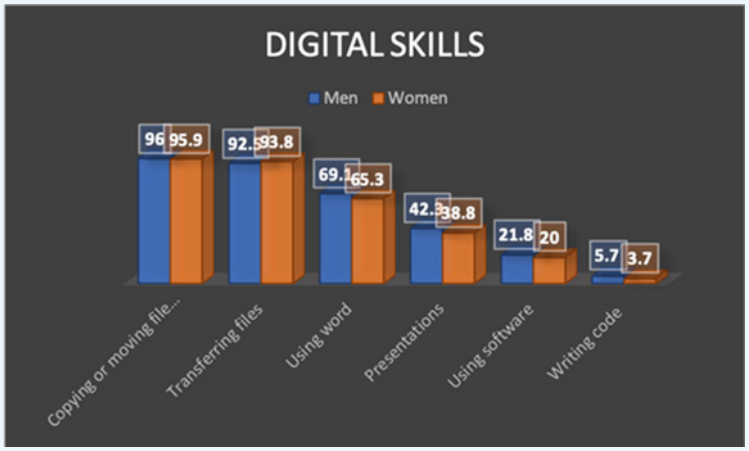
Montenegro's ICT sector is emerging as one of the key contributors to the country's economic revival, alongside the traditional industries of tourism, energy and agriculture. Innovative Montenegrin ICT companies and start-ups are gradually entering international markets with positive prospects in terms of income generation and job creation. The IT sector has been recognized as one of the most important sectors for future economic development in Montenegro. In terms of digital development, Montenegro is one of the most dynamic of the Western Balkan 6 (WB6) countries.

Montenegro holds 73rd place in the World Economic Forum's Global Competitiveness Index 2019.

Women's access to ICT

Women's access to ICT

Montenegrin citizens have a lower than desired level of digital adoption, and women are particularly disadvantaged. Montenegro trails its regional competitors as well as highly developed countries with regard to Internet users per capita. Significantly fewer women than men rarely access the Internet, probably because of gender-specific barriers.



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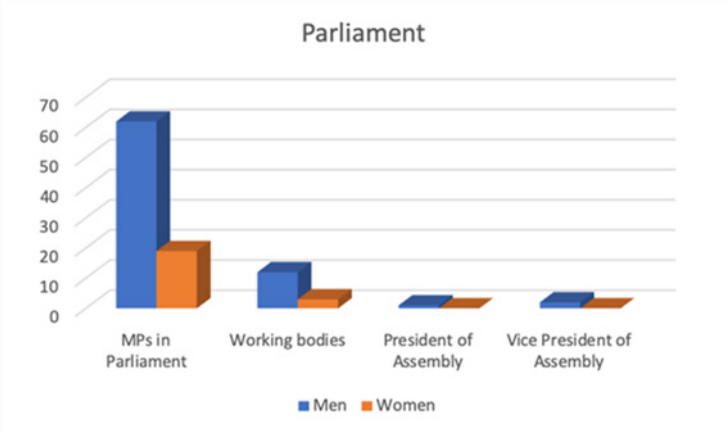
5. Country profile: Montenegro

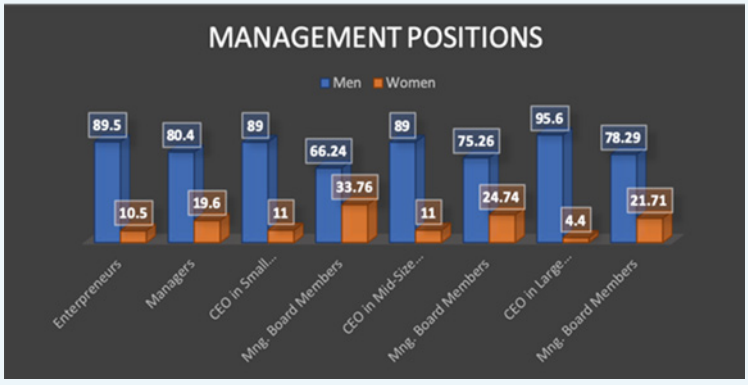
Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

Women in Montenegro constitute half of the population (50.61 per cent), but almost half are unemployed. Women's participation in the public sector demonstrates grave gender inequality. Montenegro has 81 Members of Parliament, of whom 19 are women (23.45 per cent), which is an increase over the previous convocation. The President and the two Vice-Presidents of the Assembly are men. Of the 15 permanent working bodies of the Parliament, only three have women members, namely the Legislative Committee, the Gender Equality Committee and the Anti-Corruption Committee.



Nearly 15 per cent of Montenegrins are early-stage entrepreneurs, of whom 10.5 per cent are women, which is above the Eastern European average. This suggests that the problem is not a shortage of companies being established, but rather that companies struggle to succeed enough to grow into a medium or large firm. Entrepreneurship also has gender gaps: only 19.3 per cent of firms have a woman manager, and just 10.5 per cent are owned by a woman.



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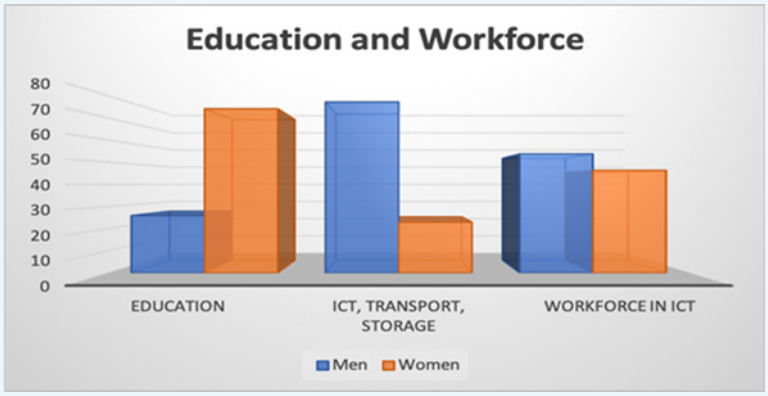
5. Country profile: Montenegro

Woman and ICT education

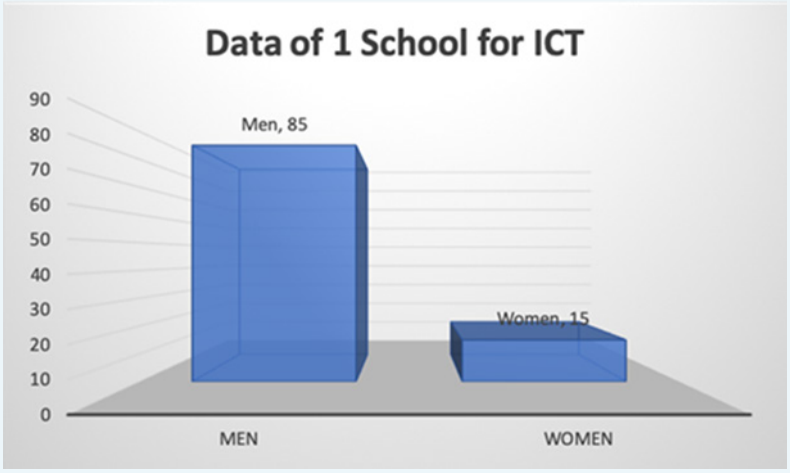
Women in ICT education

Women are significantly under-represented in ICT education, VET and tertiary education.

With regard to fields of study, more women graduate in the subject areas of education, business, law and philosophy, whereas more men graduate in ICT, transport and storage.



Professional staff in the ICT sector in Montenegro receive higher education at five universities. Montenegro secondary schools take part in EU Code Week.



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5. Country profile: Montenegro	
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** Montenegro has signed and ratified the Council of Europe Convention on Cybercrime and has recognized the problems that may be caused by the development of ICT. It has also adopted a law on information security to protect the confidentiality, availability and integrity of data, as well as the Montenegro Cybersecurity Strategy 2018-2021. In 2012, the Directorate for Protection against Computer and Security Incidents on the Internet was formed, which is the central body for coordinating the prevention of and protection against cyberincidents and other security risks to information systems in the territory of Montenegro. In 2017, the Information Security Council was formed to advise the Government of Montenegro on all relevant issues. The implementation of the Istanbul Convention is proceeding slowly, and gender-based violence remains a serious concern. Despite an increase in criminal complaints, the combination of a lenient penal policy and the practice of processing gender-based violence cases as misdemeanors risks discouraging victims from reporting offences. There has been little improvement in the capacity and gender sensitivity of existing institutions. Effective victim support services and better and more accessible legal aid are yet to be provided.
Stakeholders	**Stakeholders: Policy-makers** The Ministry of Public Administration, the Ministry of Science, the Directorate for Electronic Communication of the Ministry of Economy, the Ministry of Sport and Youth, the Ministry of Education, the Ministry for Information Society and Telecommunications and the Directorate for Electronic Communication, Postal Service and Radio-Spectrum of the Ministry of Economy. **Stakeholders: Executive level** The Chamber of Engineering, the Chamber of Commerce, the Digital Transformation Committee and the Centre for Entrepreneurship and Economic Development. **Stakeholders: Academia, accelerators, incubators** **International organizations and NGOs:** Digitalizuj.Me, UNICEF Montenegro, Red Cross. **Academia:** University of Montenegro (ICT Research Centre), Mediterranean University (Faculty for Information Technologies), Donja Gorica University (Faculty for Information Technologies). **Accelerators, incubators and early programmes:** Science Technology Park Podgorica, Innovation and Entrepreneurial Centre Tehnopolis, Hakaton, Laboratory Kreativitator, Montenegrin IT Cluster.

6. Country profile: North Macedonia

Industry background

North Macedonian ICT industry

The total ICT market value in North Macedonia was an estimated USD 400 million in 2018.

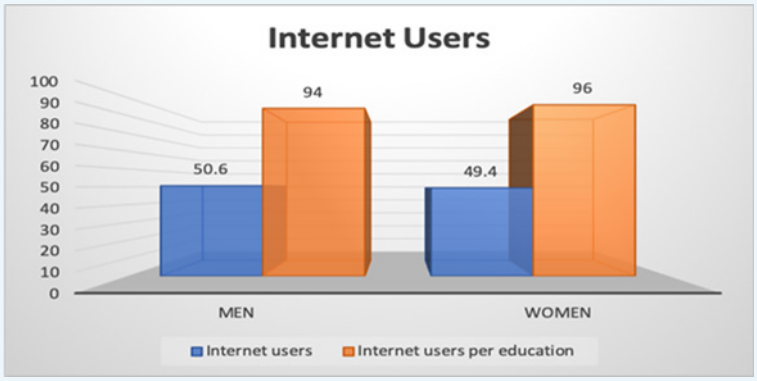
Many large ICT companies, such as Microsoft, Cisco, Oracle, Dell, Compaq, Hewlett Packard, IBM, Sun Microsystems, Apple and Lotus, are present in North Macedonia via branch offices, distributors, dealers, resellers, solution providers and business partners. With an annual growth rate between 2.5 and 8 per cent over the last several years, the ICT sector in North Macedonia is a promising area for United States companies.

The ICT sector in North Macedonia benefits from a skilled and cost-effective workforce with excellent English language skills, solid telecommunication infrastructure and low corporate tax. ICT representatives expect the sector to continue to grow.

Women's access to ICT

Women's access to ICT

Of the total number of Internet users in 2017, 49.4 per cent were women and 50.6 per cent were men. Data by age group show that the percentage of regular users is highest among individuals aged 15-24 years; 95 per cent of women and 100 per cent of men in this age group are regular users. The smallest percentage of regular users is registered in the 55-74 age group. Data also show that the percentage of regular users is highest among populations with a tertiary education, in which 96 per cent of women and 94 per cent of men are regular users. The percentage of regular users is smallest in populations with only primary education, where only 51 per cent of women and 57 per cent of men regularly use the Internet.



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6. Country profile: North Macedonia

Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

Employment in North Macedonia is characterized by an unfavourable gender structure. The Government has adopted a national action plan to implement the Istanbul Convention and a national action plan for gender equality for 2018-2020, which proposes introducing a 50 per cent quota by 2020 to ensure female participation in electoral processes and decision-making. There is a 27 per cent gap between women and men in participation in the labour market. Inadequate access to childcare, transportation and well-lit travel routes, as well as responsibilities for caring for elderly family members, limit women's ability to work outside the home. Traditional gender norms and limitations on women's freedom of movement outside the home result in some women not being in a position to learn new skills (such as teaching, IT, hairdressing and embroidery).

There is a significant difference between women and men employed in the ICT sector, in particular in senior and management positions, with ratio of 80 per cent men to 20 per cent women. Women are also severely under-represented among company owners and in public sector jobs.

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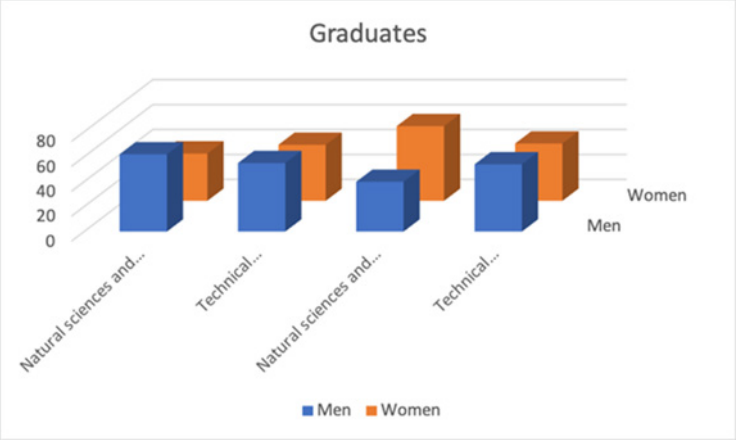
6. Country profile: North Macedonia

Woman and ICT education

Women in ICT education

Over the years, there has been an increase in the number of women enrolling in higher education, most notably in the second and third cycles, and in the number of graduate from the first, second and third cycles. The number of women enrolled in and graduating from the first, second and third cycles is generally higher in social sciences, humanities and medical sciences, while for technical and technological sciences, the number of women is lower in comparison with male students.

Women are more likely than men to choose general programmes or social sciences as their primary field of education.



North Macedonia has the highest number of recommended hours for ICT as a compulsory separate subject in primary education (around 150 hours), and digital competence is addressed as a compulsory separate subject. North Macedonia is also one of nine countries in which provision of continuing professional development in digital education is mandatory. North Macedonia has adopted a strategy for education for 2018-2025 and an action plan in 2018 with aim of supporting students in developing critical thinking and becoming active citizens.

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6. Country profile: North Macedonia	
Good practices	**Good practices in informal ICT education** The Macedonia Chapter of **Women in Tech** launched on 25 September 2019. Women in Tech is an international non-profit organization with a double mission: to close the gender gap and to help women embrace technology. The organization focuses on four primary areas that represent a call for action: education, entrepreneurship, events and research. The aim is to educate, equip and empower women and girls with the necessary skills to succeed in STEM career fields in the ICT sector, such as programming, digital marketing and social media. This project provides free programming workshops, mentoring sessions and other educational content.
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** The legal framework of North Macedonia is largely in line with European Union legislation, but it needs upgrading following the ratification of the Istanbul Convention. The Government adopted a national action plan for implementing the convention and a national action plan for gender equality for 2018-2020, which proposes introducing a 50 per cent quota by 2020 to ensure female participation in electoral processes and decision-making. In July 2018, the Government also adopted a national cybersecurity strategy for 2018-2022, which provided for remedy for the impacts of cybersecurity incidents. The Government has adopted a strategy to prevent violence against children and protect children from all forms of violence for 2020-2025 and an accompanying action plan for 2020-2022. Based on the data available and the survey responses, there appears to be no national safer Internet centre in North Macedonia. The Faculty of Computer Science and Engineering is instead responsible for organizing Safer Internet Day. On Safer Internet Day 2019, a panel discussion on IT was held for teachers from primary and secondary schools around the country to emphasize the importance of keeping children safe on the Internet. There is a growing need to educate parents and teachers about child online protection. The Privacy Lessons project, organized by the Data Protection Agency, has been delivered in 21 secondary schools. The Metamorphosis Foundation for Internet and Society is also active in the area of child online protection. In 2015, the foundation published a guide for parents. It is also creating a website on child online protection.

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6. Country profile: North Macedonia	
Stakeholders	**Stakeholders: Policy-makers** The Ministry of Information Society and Administration and the Ministry of Transport and Communications. **Stakeholders: Executive level** The Agency for the Promotion of Entrepreneurship, the Fund for Innovation and Technological Development, the Chamber of Information and Communication Technologies (MASIT), the Agency for Electronic Communications, the Agency for Audio and Audiovisual Media Services, the Macedonian Academic and Research Network (MARnet) and the Macedonian e-Society Association (MESA). **Stakeholders: Academia, accelerators, incubators** **International organizations and NGOs:** Metamorphosis Foundation for Internet and Society, Association for Information and Communication Technologies (ICT-ACT). **Academia:** Ss. Cyrill and Methodius University in Skopje, St. Kliment Ohridski University in Bitola, Goe Delchev University in Shtip, St. Paul the Apostle University for Information Science and Technology in Ohrid, State University of Tetovo, European University of Skopje, South East European University in Skopje, FON University in Skopje, American College in Skopje, Management and Information Technologies Skopje (MIT), International Slavic Institute Sveti Nikole, International VISION University. **Accelerators, incubators and early programmes:** Seavus Accelerator, HUB Skopje Business Accelerator, Social Innovation Hub, Development Association Start-up Zone in Ohrid, South Central Ventures, SEEU Tech Park Tetovo, Macedonia2025, City of Skopje Innovation Center – SkopjeLab, Start-up Academy, Crimson Capital, Faculty of Information and Communication Technologies, Fund for Innovation and Technology Development, CEFE Macedonia, Swiss EP, SEAF, Ceed Hub, World Business Angels Investment Forum, CEED Business Angels Club, Business Angels of Macedonia - i2ban, Social Impact Lab.

7. Country profile: Serbia

Industry background

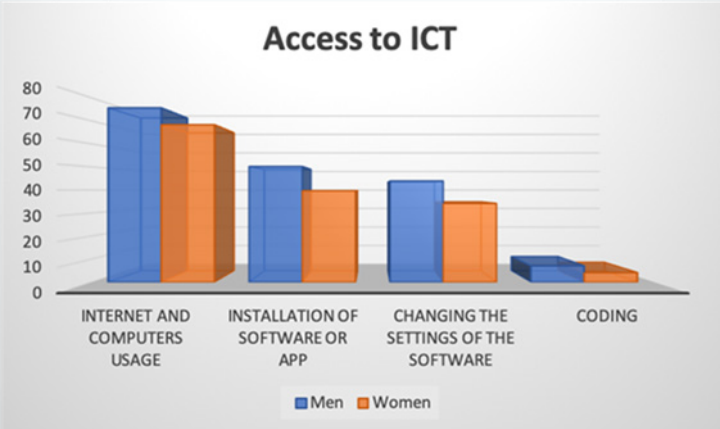
Serbian ICT industry

Serbia provides a cost-effective alternative to established markets for companies looking to outsource software engineering, offshore systems design and integration. Over 2 600 ICT companies operate in Serbia, including a Microsoft development centre. Serbia offers expertise, high-end IT development services and software development solutions in a highly competitive global sector. Nearly 39 000 ICT professionals are highly trained and available for a fraction of the price of those in the European Union. Adobe, Oracle, Google, IBM, Siemens and many other companies are currently partnering with Serbian companies for their back-office development tasks and are helping to create a Balkan Silicon Valley. ICT is a priority sector for the Serbian Government. Increased support for ICT attracts investors and employment opportunities.

Women's access to ICT

Women's access to ICT

Women in Serbia use the Internet and computers less than men. Women are generally equal to men in terms of meaningful access to the Internet, such as using the Internet to access a bank account, pay a bill, buy something online, make or receive a digital payment or use money services in general, send or receive e-mail, upload content, sell goods or services, or complete an online course. In terms of advanced skills, however, the difference is more prominent. For example, men are more comfortable installing software or applications, changing software settings, including in the operating system and security programmes, and writing code.



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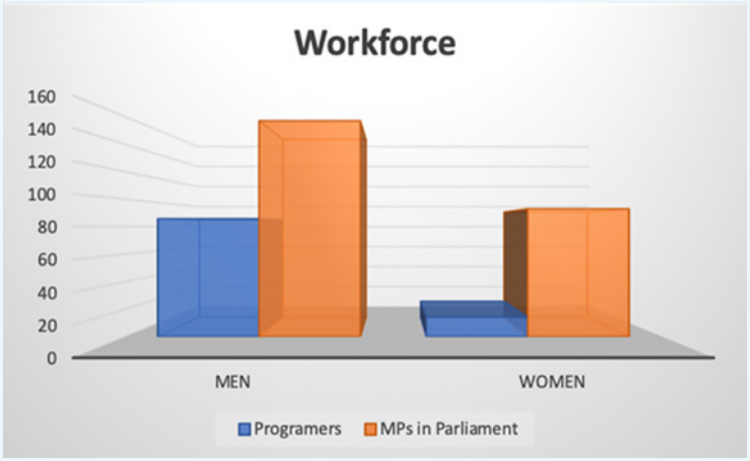
7. Country profile: Serbia	
Women participation and leadership in the ICT industry	**Women's participation and leadership in ICT** Women own a third of all start-ups in Serbia, employing more than 200 000 people. Only 14.2 per cent of programmers are women; while this is in line with the industry average in Silicon Valley, much remains to be done to encourage more equality in technology ecosystems. In short, there is considerably less female entrepreneurship than male entrepreneurship in Serbia, and female entrepreneurship is characterized by a focus on services and the trade sector, often simpler legal forms than in male enterprises and a higher rate of company closures. The greatest progress in gender equality has been made in the area of politics, given to the increased participation of women in the Parliament, the Government and local assemblies. Women have a higher level of representation in the Parliament compared with other Western Balkan countries, as 93 of the 250 Members of Parliament are women. 
Woman and ICT education	**Women in ICT education** Women account for more than a half of all graduates in education, while men are dominant in the fields of ICT, engineering, manufacturing and civil engineering. Women and men are equally represented in the service industry. Serbia also has a gender gap in digital skills among the working population. Surveys show that 62.6 per cent of respondents have no or low digital skills, while 37.3 per cent have basic or higher skills. Serbia became the first non-European Union country to introduce the Gender Equality Index, and it is the leader in Europe in terms of the number of women involved in regional ICTs. While only 27 per cent of women are enrolled in computer science and electronics studies, showing that the ICT field remains male-dominated, Serbia is above the average for European Union countries (just over 18 per cent).

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7.	Country profile: Serbia
	As for digital education in general, Serbia is one of eight countries in Europe that uses both the European definition and a national definition of key digital competences. Serbia has developed a distinct digital competence framework for teachers, which provides a complete map of the essential competences, including those related to the pedagogical use of technologies. Serbia is one of the few countries that recognizes digital competence at the end of secondary education and includes it on certificates. National testing of digital competence at secondary education level (International Standard Classification of Education levels 2 and 3) was piloted in 2017. Serbia is also one of only four countries in Europe to test digital competence among a sample of pupils as part of quality assurance processes, which is a recent development.
Good practices	**Good practices in informal ICT education** Serbia celebrates **Girls in ICT Day** and has a chapter of **Women in Tech**. As a part of a bigger project known as **Digital Serbia**, the Ministry of Trade, Tourism and Telecommunications has launched a digital school project for primary schools. The recently launched **initiative to develop ICT infrastructure in education, science and cultural institutions** is in the process of connecting all schools in the country to the Academic Network. The Smart and Safe platform, presented by the Ministry of Trade, Tourism and Telecommunications, is designed to raise awareness of the importance of citizen engagement with the education system and the greater digital economy. The platform creates educational and promotional projects to support digital literacy, digital competences and digital security culture throughout society. In line with regulations governing the protection and safety of children using new technology, the Ministry of Trade, Tourism and Telecommunications has also established a centre to offer advice, help, information and research to children, parents, teachers and other relevant individuals with regard to online safety. Problems can also be officially reported at the centre.
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** Violence against women in Serbia is of significant concern. Five out of six women surveyed said that violence against women was common, and over a third said that it was very common. A new European Union-backed Gender Equality Index for Serbia was published in December 2018, which indicated that the greatest progress in gender equality was made in politics, given the increased participation of women in the Parliament, the Government and local assemblies. The role of the media in perpetuating gender stereotypes and minimizing gender-based violence remains a concern. As for cyberbullying, 54.31 per cent of survey participants said that they had experienced online violence, primarily harassment, violent comments, threats and blackmail. Among individuals, 49.10 per cent had personally experienced online violence.

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7. Country profile: Serbia

Stakeholders

Stakeholders: Policy-makers

The Ministry of Education, Science and Technological Development, the Serbian Agency for Telecommunications (RATEL), the Ministry of Trade, Tourism and Telecommunications, the Ministry of Telecommunications and Information Society, the Regulatory Agency for Electronic Communications and Postal Services, the Academic Network of the Republic of Serbia, Telecom Serbia, the Office for IT and e-Government, the Ministry of Public Administration and Local Self-government and public utility company Informatika.

Stakeholders: Executive level

The Agency for the Promotion of Entrepreneurship, the Innovation and Technological Development Fund, the Union of ICT Societies (JISA) and the Serbian Chamber of Commerce.

Finance: South Central Ventures (a high-risk investment fund that allocates EUR 40 million to technology start-ups), Telecom Serbia (which provides financial support to start-ups through the mts Start-up Acceleration programme), the Serbian Innovation Fund, the Serbian Private Equity Association and the Serbian Business Angel Network.

Stakeholders: Academia, accelerators, incubators

Academia: Faculty of Electrical Engineering in Belgrade, Faculty of Mechanical Engineering in Belgrade, Technical University in Novi Sad, Faculty of Computing in Belgrade, Faculty of Organizational Sciences in Belgrade, Faculty of Mathematics in Belgrade, Faculty of Transport and Traffic Engineering in Belgrade.

Accelerators, incubators and early programmes: StartLabs, Impact Hub Belgrade, IT Cluster Vojvodina, SEE ICT Potkrovlje Hub, Association of Business Women, business incubators (approximately 15 across Belgrade, Novi Sad and other cities), StartLabs (first Serbian/USA accelerator and seed fund), Vojvodina ICT Cluster (a business association founded as a bottom-up initiative of ICT companies and supporting institutions), ICT Network Serbia, Nis Cluster of Advanced Technologies, ICT Cluster of Central Serbia, South-East Europe Information and Communication Technologies (SEE ICT) (a Belgrade-based association which provides support to start-ups and entrepreneurs), BioSense Institute, Digital Serbia Initiative.

Private sector: Arthur D. Little, Huawei, ZTE, Cisco SR, Ericsson, Microsoft, NCR, S&T Serbia, HP Computing and Printing, Dell, IBM, Schneider Electric DMS NS.

8.	Country profile: Ukraine
Industry background	**Ukrainian ICT industry** Ukraine seems to be the biggest piece of the puzzle, with 245 companies that generate almost USD 2.1 billion in revenue. An educational system focused on mathematics, physics and engineering – one of the few positive fallouts from the Communist era – has helped create one of the region's biggest talent pools second only to Poland, which in recent years has actively sought to recruit Ukrainian workers. Ukraine has over 170 000 IT specialists. Consequently, Ukraine has become a top performer in the field; over 20 per cent of the leading Fortune 500 companies have offices in Ukraine, according to a recent study by UNIT.City, a Kyiv-based innovation park.
Women's access to ICT	**Women's access to ICT** Some 29-30 per cent of the population knows how to use a computer, with near parity between women and men. In the 30-39 and 40-49 age ranges, women appear to have a better understanding of computers than men. However, in the 15-19 and 20-29 age groups, the reverse was evident, with young men tending to have a stronger understanding of computers than young women. In employment, the percentage of women who reported that they knew how to use a computer was higher than that of men by around 6 per cent in the manufacturing, agricultural and services sectors. In the non-production sector, on the other hand, 6 per cent more men than women reported knowing how to use a computer. Some of these trends are mirrored in women and men's access to computers.

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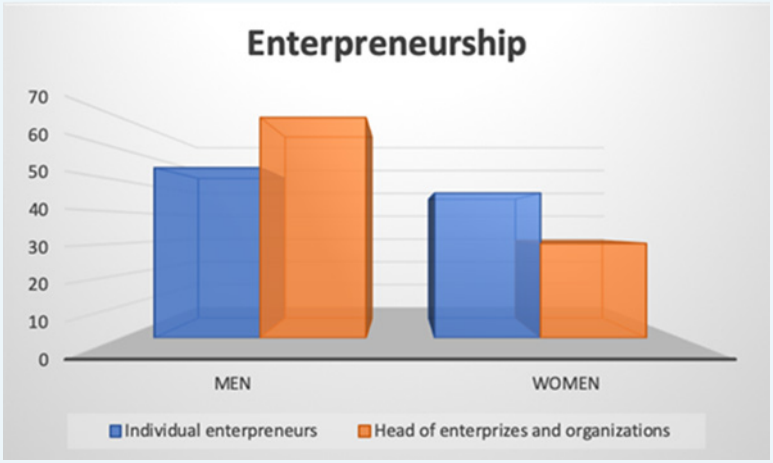
8. Country profile: Ukraine

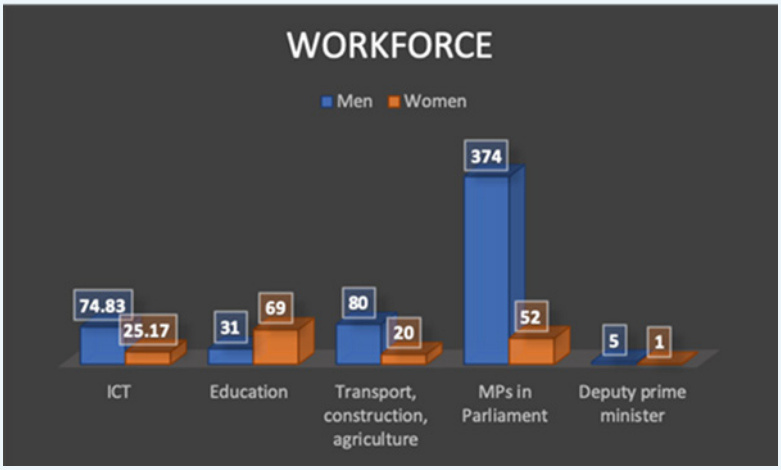
Women participation and leadership in the ICT industry

Women's participation and leadership in ICT

The culture in Ukraine has not historically been supportive of entrepreneurship, and there have been relatively few entrepreneurial success stories to date, leading to a lack of role models that would make entrepreneurship attractive. Recently, there has been a growing number of accelerators, incubators and events to support entrepreneurship, but there is potential to significantly expand such activities. Women account for 46 per cent of individual entrepreneurs yet lead only 30 per cent of enterprises and organizations.



Women represent 24 per cent of the Ukrainian IT-industry. In the ICT sector, 74.83 per cent of management positions are held by men, compared with 25.17 per cent held by women, which is significant difference. Education is the only sector where most managers are women. Sectors with a high share of female managers also include public administration and defence, social security and the hotel and restaurant business. Sectors where an overwhelming majority (a difference of more than 8 percentage points) of managers are men include transport, construction, agriculture, the extractive industry and power engineering. The percentage of female managers is greater in smaller cities and villages, including in the ICT sector.



(continued)

8. Country profile: Ukraine	
Woman and ICT education	**Women in ICT education** Technical education is the foundation of Ukraine's IT ecosystem. Every year, over 150 000 students graduate, of whom around 40 000 obtain degrees in technological studies, including some 15 000 IT specialists. Additionally, around 40 000 IT specialists graduate annually from IT schools. Although Ukraine's education system continues to be strong in mathematics and sciences, universities need fundamental reform. In 2017, Women Who Code established a local network in Kyiv dedicated to supporting career-aged engineers to achieve their professional goals. The local group hosts regular programmes, including educational events and leadership training. The structure of universities and training institutes, as well as their curricula, is matched to the old economy rather than the future economy. Weak business and management education may be a barrier to innovation and entrepreneurship. Due to the lack of job opportunities for university graduates, many highly skilled Ukrainians work in other countries or work for companies based in other countries.
Dark side of ICT and cyberviolence	**Dark side of ICT and cyberviolence** Ukraine faces unprecedented challenges affecting gender equality and the enjoyment of equal rights and opportunities by women, particularly those facing multiple forms of discrimination. The structural discrimination of women persists in both the public and private spheres to varying extents. The roots can be found in patriarchal attitudes and stereotypes, as well as deeply entrenched systemic gaps, such as: the weak rule of law; the low capacity of institutional mechanisms to achieve gender equality; a lack of political will and low awareness of international and national gender equality commitments; chronic underinvestment in gender equality; lack of access to data and the inability of policy-makers to use data to inform policies, reforms, plans and budgets; and a lack of a meaningful engagement with civil society. In 2017, Ukraine adopted a law on preventing and counteracting domestic violence. In early 2019, it finally criminalized domestic violence. Cyberspace in Ukraine is rife with abusive and harmful expressions of violence. The ebb and flow of gendered abuse often reflects temporal or situational events in the country's political life. Spikes in online violence against women often coincide with four major events: scheduled releases of annual government data; electoral cycles; salient political events; and highly visible or controversial actions by women in the public eye. Socio-psychological online attacks in Ukraine typically include accusations of moral deficiency and lack of intelligence. In many cases, perpetrators who attacked politicians endeavoured to degrade victims by questioning their abilities as civil servants. An analysis of data from 2014-2018 showed that women were more likely to face socio-psychological harassment. Women tend to be very harshly critiqued for their appearance, age and clothes, and they primarily face attacks against their physical appearance, intelligence and professional competence.

(continued)

8. Country profile: Ukraine

Stakeholders

Stakeholders: Policy-makers

The Ministry of Digital Transformation, the Ministry of Infrastructure, the Ministry of Education and Science, the State Educational Quality Service, the State Service for Special Communications and Information Protection and the National Commission for the State Regulation of Communications and Informatization.

Stakeholders: Executive level

The IT Ukraine Association, the Ukrainian HI-TECH Initiative, the Association of Information Technology Enterprises, the Ukrainian Internet Association, the Kharkov Technologies Centre of Small Business Development, the Lviv Centre for Science, Innovation and Informatization and the Ukrainian Software Quality Board.

Stakeholders: Academia, accelerators, incubators

Academia: National University of Kyiv, Poltava University of Economics and Trade, Donetsk National University, Kharkiv National University of Radio Electronics, Simon Kuznets Kharkiv National University of Economics, Taras Shevchenko Kyiv National University, National Technical University of Ukraine, State University of Information and Communication Technologies, Ivan Franko National University of Lviv, Lviv Polytechnic National University, V.N. Karazin Kharkiv National University, Kharkiv Polytechnic Institute National Technical University, Vinnytsia National Technical University, Odessa National Polytechnic University, Sumy State University.

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8.	Country profile: Ukraine
	Accelerators, incubators and early programmes: Arkley Launchpad VC, Business Incubator Group Ukraine, Enterprise Europe Network, IT Creative Fund (established by the Cabinet of Ministers to train new experts in the IT industry), UNIT.City (the first Ukrainian innovation park), Kievskaya Polytechnica technical park, GrowthUP (This is the first Ukrainian accelerator dedicated to technology start-ups that works with projects from the earliest stages of development. The accelerator was established in 2008 at the consulting firm Bay View Innovations, a subsidiary of the BVU Group. More than 300 mentors from Europe and the United States (around 75 per cent from C-level) are currently mentoring projects. The accelerator programme lasts 4 months, including one month in Berlin and one month in Silicon Valley to meet with mentors and access the network. The GrowthUP+ fund provides sums of up to USD 50 000.), Polyteco Business Incubator (based at the National Technical University of Ukraine), Polyteco Youth IT Business Incubator (a student entrepreneurial initiative based on progressive ideas in the sphere of IT, which helps to launch businesses and support innovative ideas from students, postgraduates and young scientists from the university in the sphere of IT), Happy Farm Business Incubator (founded in 2012 to provide business development services for start-up teams or companies and support further investment in start-up companies), the Brain Basket Foundation (which has launched 100 study hubs all over Ukraine to train IT professionals of all levels), and a pan-Ukrainian social educational programme for IT school teachers. **Private initiatives:** LITS in Lviv, Gelel in Odessa, Ukrainian IT School in Kharkiv, SkilssUin Dniprok GoIT in Kyiv and ITStep in every large city. There are IT clusters in the largest cities: Lutsk, Kyiv, Cherkasy, Kharkiv, Odessa and Dnipro.

List of interviews

Albania

- Estela Bulku, UN Women national programme officer, Albania
- Megi Llubani, United Nations Joint Programme End Violence against Women in Albania (EVAW) technical project analyst, Albania
- Edlira Kasaj, digital entrepreneur, ICT specialist, Albania

Bosnia and Herzegovina

- Erma Mulabdic, UN Women technical specialist, Bosnia and Herzegovina
- Zerina Mandzo, IT Girls project officer, Bosnia and Herzegovina
- Maja Miljevic, entrepreneur and head of start-up enablement at Maestral Solutions, Bosnia and Herzegovina

Georgia

- Ana Pashalishvili, project manager, UN Women Georgia
- Nino Nanitashvili, Google Women Techmakers/Innovation Support Fund, Georgia
- Nino Enukidze, rector of the Business and Technology University, Georgia
- Nino Dvalidze, My Nanny start-up founder, Georgia

Serbia

- Zorana Kataranovski, UN Women Serbia
- Tatjana Kecojevic, data scientist, founder of Sister Analyst, Serbia
- Gaia Montelatici, founder of Studio X Ventures, co-founder of Impact Hub Belgrade, Serbia

North Macedonia

- Vesna Ivanovikj, head of UN Women, North Macedonia
- Jasmina Trajkovski, PhD in computer and information sciences, information security consultant, North Macedonia
- Zaklana Gestakovska, Initiative for Gender Equitable HR Practices in IT Companies, North Macedonia
- Anita Nikova, ICT Chamber of Commerce, North Macedonia

Montenegro

- Kaca Djurickovic, UNDP gender programme officer, Montenegro

Moldova

- Svetlana Andries, programme coordinator, UN Women, Moldova
- Irina Oriol, Tekwill, Moldova

Ukraine

- Polina Boichuk, STEM IS FEM, Ukraine
- Maryna Saprykina, managing director of CSR/STEM for Girls, Ukraine
- Erika Kvapilova, UN Women Ukraine
- Roman Hapachylo, vice-president of talent management, Intellias, Ukraine

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