Women in Serbia's ICT Sector

UNDP SERBIA AND UNDP ACCELERATOR LAB * 2022-2023

The United Nations Development Programme (UNDP) and the UNDP Accelerator Lab in Serbia are extensively researching Women in STEM fields. This research utilizes official and alternative data sources, along with women's personal stories, to gain a comprehensive understanding of aspects that statistics alone cannot capture. Collaborating with actors from various sectors and industries, including teachers, state institutions, and IT company managers, our goal is to empower women as winners of the 4th Industrial Revolution and help them overcome the invisible barriers that hinder an equal distribution of power in society.

The research was implemented by Zoja Kukić Đorđević and Valentina Čolić Mihajlović. The information and views presented are those of the authors and do not necessarily reflect those of the United Nations or UNDP.

The publication before you presents the main findings regarding the position of women in Serbia's ICT sector. For more details on our research, please visit https://lab.undp.org.rs/women-in-stem-in-serbia/.

You can find more information about UNDP's work at https://www.undp.org/serbia.

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Abbreviations

GDP – Gross Domestic Product

EU – European Union

IT – Information technology

ICT – Information and communication technologies

PISA – Programme for International Student Assessment

USA – United States of America

STEM – Science, Technology, Engineering, Mathematics

UNDP – United Nations Development Programme

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Introduction

Women account for half of the world's population, but less than a quarter of the population which builds the digital society that encompasses all of us. If we are to benefit from digital development equally, then it is essential that we equally participate in its creation. A prerequisite for this is the proportionate representation of men and women in the professions that create digital society, in particular science, technology, engineering and mathematics – STEM.

Historically, the contribution of STEM fields to social development, from mathematics and physics to information science, has been extraordinary. It is in these fields that innovation is born and fostered, and innovative solutions are developed to boost productivity and drive new industries and job creation. STEM has an outstanding impact on economic growth, while new technologies, such as artificial intelligence, biotechnology and renewable energy will play a crucial role in the future, not only in terms of economic growth and development, but also in terms of improving living conditions.

Within STEM, information and communication technologies (ICT) have a prominent place. The development of the ICT industry and efficient use of ICT in the business sector result in higher productivity and competitiveness, thus enabling competitiveness in the international market and facilitating sustainable economic growth, which is a prerequisite for poverty reduction.

These technologies transform different aspects of our lives and considerably impact multiple disciplines, extending their boundaries and becoming a catalyst for innovation and multidisciplinarity. For instance, the area of smart cities integrates urban planning, ecology, transport, and ICT in order to create sustainable and efficient cities. The combination of these disciplines and technologies results in innovative solutions to address complex urban challenges.

Multidisciplinarity opens possibilities for horizontal career and occupational shifts, which presents an important opportunity for women, who are traditionally more represented in social science and humanities-oriented occupations. Numerous digital linguistic tools, telemedicine, digitalization of cultural heritage, digitalization of education, are only some of the examples of ICT combined with other areas dominated by women.

Just as digitalization of society creates major opportunities for women's empowerment and enhancement of gender equality, it also carries major risks of deepening the existing gender gap. Given that women have lower access to the internet[1] and weaker digital skills, and that they are more prevalent in non-technology-related jobs which are at the highest risk of being automated (such as work at customer service counters or store checkouts), the concern that they might end up as digital revolution losers is justified.

1 Globally, men have 21% higher Internet access than women (UNDP Gender Equality Strategy 2022-2025) https://www.undp.org/sites/g/files/zskgke326/files/2022-09/UNDP_Gender_Equality_Strategy_2022-2025_EN.pdf

Even though ICT is the fastest-growing sector and has the highest demand for a skilled workforce, as well as the fact that it employs an increasing number of women, the disparity between the share of men and women is still pronounced, reflecting the pattern present in other traditionally 'male-dominated' areas. The root causes of women's lower share may be found already at the youngest ages, when girls and boys are directed towards different ways of playing considered appropriate for female and male children; this is followed by encouragement to pursue different education pathways, and results in gender segregation in occupations, employment, and career advancement. With their lower share in the ICT sector, women have lower chances of participating in and driving ICT solutions. This also has an impact on technologies' limited capacity to respond to women's needs and benefit them. In the broader social context of gender inequality, unequal power relations remain unchanged or may even deepen further.

On the one hand, the concentration of power in STEM occupations and the widening digital gender gap increase the risk of discrimination in the coming generations as well. On the other hand, it is a fact that the level of ICT use in business processes is generally low in Serbia; thus, this 'development lag' can be used as an opportunity to simultaneously address gender disparities in digital skills, before automation renders some jobs redundant[2]. With system-wide, focused efforts towards technological inclusiveness and access to technological skills, digital transformation may well contribute to closing the gender gap[3].

Why Women's Representation in ICT Matters

Women's underrepresentation in the area of information and communication technologies (ICT) bears multiple consequences, both for individuals and for society as a whole. Some of the crucial ones are:

- **Gender imbalance**: The lack of women in ICT reflects gender stereotypes and prejudices, thus creating a work environment dominated by men. This limits diversity in thinking, perspectives and approaches to problem solving, which may hinder innovation and creativity.

- **Missed talent and potential**: By excluding women from ICT, the industry misses the talent, skills, and unique contributions of women. Women have different perspectives, experiences and capabilities that can improve this area and accelerate technological progress.

- **Limited range of role models**: Women's underrepresentation in ICT means fewer visible role models for girls and women who wish to pursue careers in this area. Role models are crucial when it comes to inspiring and motivating individuals to continue

2 Gender Equality Index for the Republic of Serbia 2021 – Digitalization, future of work and gender equality , Social Inclusion and Poverty Reduction Unit of the Government of the Republic of Serbia, 2021, https://serbia.un.org/sites/default/files/2021-10/Gender%20Equality%20Index%20for%20Serbia%202021.pdf

3 UNDP Gender Equality Strategy 2022-2025, op.cit.

careers in a given area. The lack of women role models in ICT may discourage women from choosing or continuing technology-related careers.

- **Pay gap and economic disparity**: Data show that women in ICT earn less than their male colleagues, which contributes to the total pay gap in the economy. Not only does this pay gap affect individual women, but it also reflects gender-based economic disparities, thus limiting women's financial independence and opportunities.

- **Technological bias**: Women's underrepresentation in ICT may lead to biased and gender-blind technological development. Products and services designed predominantly by men may not adequately meet women's needs. This may result in biased algorithms, gender stereotypes and design that excludes women users, thus perpetuating inequality and reinforcing existing gender norms.

- **Missed opportunities for innovation**: Diversity, including gender diversity, drives innovation and creativity. Different perspectives and experiences lead to the development of more inclusive and straightforward technologies. By excluding women, the ICT industry may miss valuable insights and innovative solutions to complex problems.

- **Digital divide**: Women's underrepresentation in ICT exacerbates the digital divide, the divide between those who have access to and benefit from digital technologies and those who do not. Women may face additional barriers to accessing and using technology, as a result of which they fail to advance their digital skills and diminish their employment prospects and overall participation in the digital economy.

Addressing the issue of women's underrepresentation in ICT is crucial for building a more inclusive, equitable and prosperous society. Efforts to promote gender equality, offer equal opportunities and challenge gender stereotypes, are essential for bridging this gap and unlocking the full potential of women in ICT.

Methodological Notes

The research Women in Serbia's ICT Sector was based on domestic sources and official statistical data of the Republic of Serbia and statistics for European Union Member States. The data on the causes of the gender gap in the ICT sector are predominantly based on foreign research and studies, since such analyses are scarce in Serbia.

Current Situation in Serbia

Strategic, Legal and Institutional Framework

The need for women's equal participation in Serbia's IT sector is recognized, but a sufficiently strong strategic and institutional course of action that would drive societal change is missing.

The Gender Equality Strategy for the period from 2021 to 2030 recognizes the gender imbalance in the ICT sector, with a particular emphasis on the issue of women's underrepresentation in innovation (both social and technological)[4], while the Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024 envisages specific measures to promote ICT among women and girls, introduction of dedicated programmes for the development of advanced digital skills among young women, rural women and other vulnerable groups, especially in communities with higher unemployment or a wider digital gender gap, as well as promotion of girls' and young women's participation in the ICT sector[5]. The Strategy identifies the period of growing up and pre-university education (primary and secondary), as well as general culture and values, as critical for (in)equality in digital skills. The Strategy for Education Development in the Republic of Serbia until 2030 recognizes the importance and role of the education system in achieving gender equality[6]. It also envisages the establishment of a Higher Education Institutions' Quality Monitoring and Evaluation Framework, which includes gender equality indicators. However, gender imbalance in specific areas of education is not highlighted. In Serbia, there are currently no adequate system-wide measures aimed at addressing gender segregation in education, which leads to the feminization and masculinization of specific professions closely linked to the traditional gender roles of women and men.

The Strategy for Scientific and Technological Development of the Republic of Serbia for the period from 2021 to 2025, "The Power of Knowledge" contains only a high-level statement that it is necessary to provide system-wide support to women to develop careers in STEM and encourage women researchers to apply for managerial roles[7]. Women's share among researchers is not viewed as critical in Serbia, at 51.4%, but women's share in managerial positions is recognized as problematic, at only 34%. Nevertheless, progress should also be highlighted – at the time of drafting this Strategy, women held the position of Director in as many as five out of the six institutes of national importance.

4 Gender Equality Strategy for the period from 2021 to 2030, Official Gazette of the Republic of Serbia no. 103/2021.

5 Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024, Official Gazette of the Republic of Serbia no.21/2020, 8/2023.

6 Strategy for Education Development in the Republic of Serbia until 2030, Official Gazette of the Republic of Serbia no.63/2021.

7 Strategy for Scientific and Technological Development of the Republic of Serbia for the period from 2021 to 2025, "The Power of Knowledge", Official Gazette of the Republic of Serbia no.10/2021.

On the other hand, gender equality is entirely disregarded in the following relevant strategies: Strategy for Information Society and Information Security Development in the Republic of Serbia for the period from 2021 to 2026[8], Smart Specialization Strategy for the period from 2020 to 2027[9], Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period from 2020 to 2025[10], and Capital Market Development Strategy for the period from 2021 to 2026[11]. Since women are invisible and their situation is not recognized as a topic in these strategies, practice is very likely to remain blind to the issue of women's equal participation and gender equality in these areas.

The Anti-discrimination Law[12] and Law on Gender Equality[13] are two key legal documents geared towards advancing gender equality. The new Law on Gender Equality, passed in May 2021, contains provisions that are relevant to the ICT sector and may contribute to advancing gender equality in this sector. The Law stipulates equal pay, equal representation of men and women in all positions, reporting on gender equality in companies with more than 50 employees, and a healthy work-life balance, it valuates unpaid work, stipulates penalties for sexual blackmailing, requires employees to use gender-sensitive language, etc. The Law also stipulates fines for non-compliance with its provisions. It has laid a solid foundation for achieving gender equality in society. To achieve this, it is essential to ensure adequate mechanisms for the Law's implementation in practice, as well as to monitor progress in implementation.

Gender Gap in Technical Education

Women account for the majority of all graduates in Serbia, but only a third in the ICT sector. They prevail in most educational fields[14], with the exception of two: in ICT, where their share is at about 29%[15], and in engineering, manufacturing, and construction, at 39%

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8 Strategy for Information Society and Information Security Development in the Republic of Serbia for the period from 2021 to 2026, Official Gazette of the Republic of Serbia no. 86/2021.

9 Smart Specialization Strategy for the period from 2020 to 2027, Official Gazette of the Republic of Serbia no. 21/2020.

10 Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period from 2020 to 2025, Official Gazette of the Republic of Serbia no. 96/2019.

11 Capital Market Development Strategy for the period from 2021 to 2026, Official Gazette of the Republic of Serbia no.102/2021.

12 Anti-discrimination Law, Official Gazette of the Republic of Serbia no. 22/2009 i 52/2021.

13 Law on Gender Equality, Official Gazette of the Republic of Serbia no. 52/2021.

14 Educational fields where women prevail are education, health and social protection, arts and humanities, social sciences, journalism and media, business, administration and law, while in the areas of agriculture and services the shares of women and men are almost equal. Source: Women and men in the Republic of Serbia 2020, Statistical Office of the Republic of Serbia: https://publikacije.stat.gov.rs/G2021/Pdf/G20216001.pdf

15 Data of the Statistical Office of the Republic of Serbia for 2019 indicate 34%, and for 2020 – 29%. The first figure was taken from Women and Men in the Republic of Serbia 2020, and the second – from the Gender Equality Index 2021.

of the graduates. Looking at STEM fields in general, the share of women graduates in these fields stands at 43%. Women outnumber men only in the field of mathematics.

The share of women ICT students is higher in Serbia than in most European Union (EU) Member States and in the United States of America. In Serbia, women account for 29%[16] of students in ICT faculties, compared to the EU average of only 19%[17] and the USA level of 18%. A higher share of women than in Serbia is found only in Bulgaria and Romania, at 31%, and Greece and Sweden, at 30%[18].

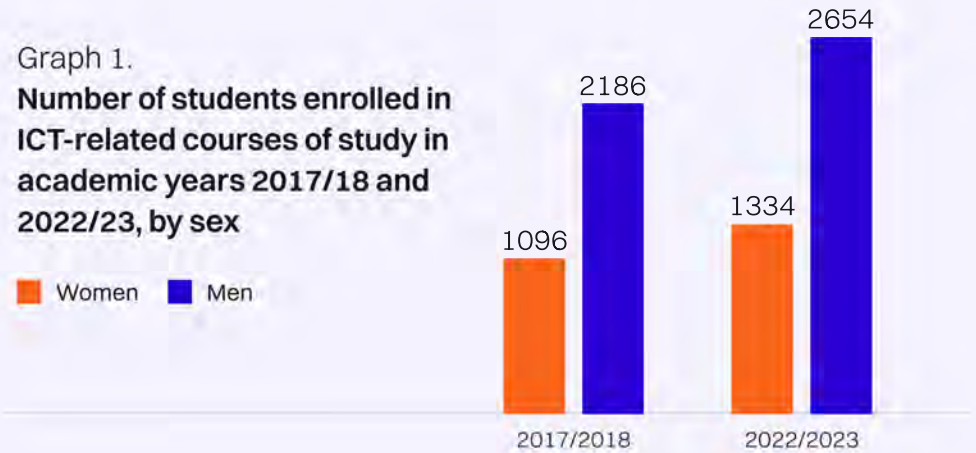
Women record higher graduation rates in all areas, especially in ICT. Out of the total enrolled university students in Serbia, 57% are women, while their share among graduates stands at 59%. Women represent 29% of students enrolled in ICT-related courses of study, while there are 37% of women among graduates. It is also positive that women represent around half of those enrolled in IT re-qualification courses organized by the Government of the Republic of Serbia. More concretely, in 2022, 55% of applicants were women.[19]

Academic Performance – Analysis of Technical Faculties in Serbia[20]

Men account for a significant majority of those enrolled in technical faculties, while differences in academic performance are almost non-existent.

In the last five years, the number of ICT students is on the rise, but the share of women has remained at the same level. According to the records of seven faculties offering IT-related courses of study in Serbia, in the academic year 2017/2018, these faculties had 3 282 students enrolled in undergraduate academic studies, while in 2022/23, the number rose to 3 988, which constituted an increase by over 20%. However, disaggregated by sex, in both enrolment cycles women accounted for one-third of the students (Graph 1).

Graph 1.
Number of students enrolled in ICT-related courses of study in academic years 2017/18 and 2022/23, by sex



16 Gender Equality Index 2021

17 DESI Report 2022, available at: https://digital-strategy.ec.europa.eu/en/policies/desi

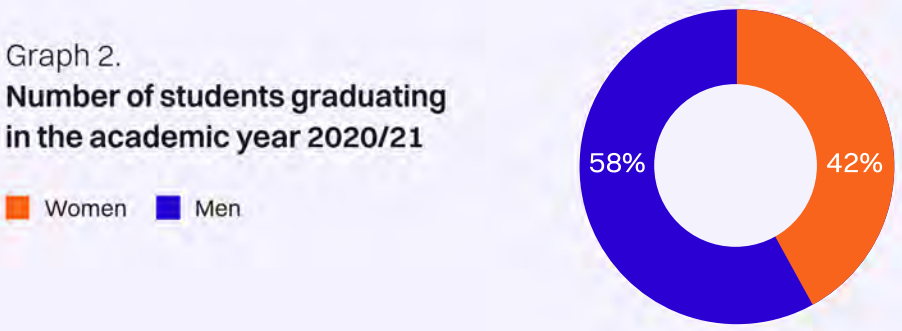
18 Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20200423-1

19 Source: https://www.undp.org/serbia/news/great-interest-attending-new-online-it-retraining-program

20 The following faculties were included in the research: Faculty of Electrical Engineering, Faculty of Mathematics and Faculty of Organisational Sciences of the University of Belgrade, Faculty of Technical Sciences of the University of Novi Sad, Faculty of Electronics of the University of Niš, Faculty of Science and Mathematics of the University of Kragujevac, and School of Computing of Union University

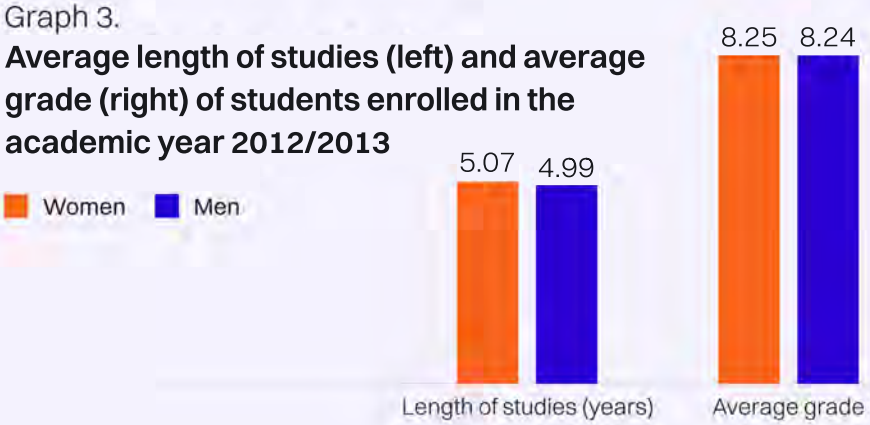
Compared with official statistics, the records of the seven analysed faculties indicate that the share of women among graduates is higher (at 43%) than their share among enrolled students (33%) – Graph 2.

Graph 2.
Number of students graduating in the academic year 2020/21



However, there are no significant disparities between women and men with regard to academic performance, based on length of studies and average grade during studies (Graph 3).

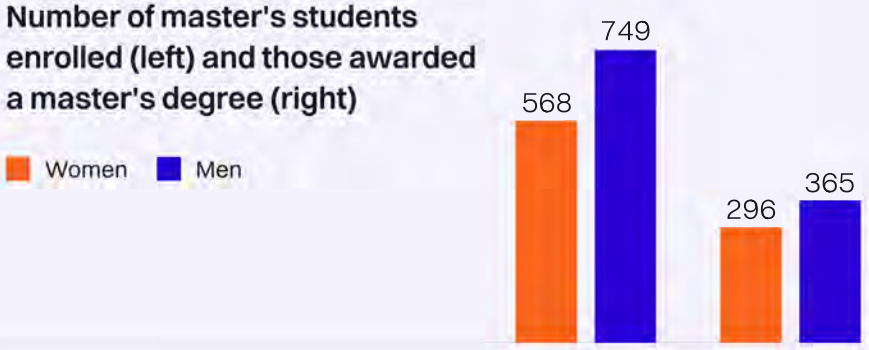
Graph 3.
Average length of studies (left) and average grade (right) of students enrolled in the academic year 2012/2013



The share of women enrolled in master studies is somewhat higher compared to undergraduate studies. The respective shares of men and women enrolled in master studies correspond to those among graduates of undergraduate studies (43% women and 57% men). In addition, women perform somewhat better when it comes to the completion of this level of studies (Graph 4).

Graph 4.

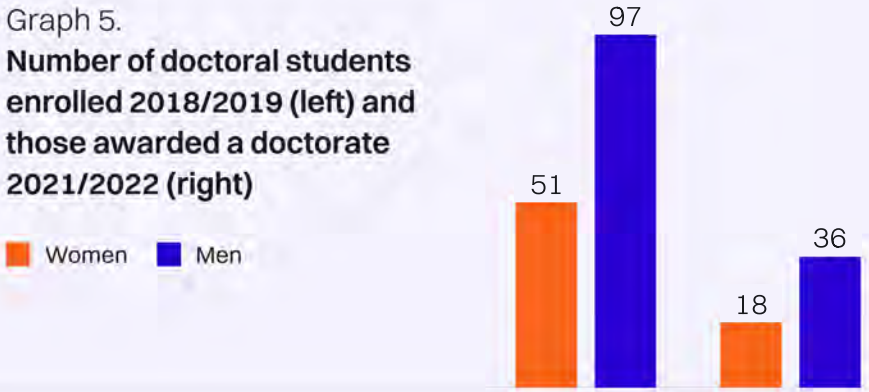
Number of master's students enrolled (left) and those awarded a master's degree (right)



In doctoral studies, the respective shares of women and men are close to those observed in undergraduate studies. The number of women who enrol in and finish doctoral studies is twice lower than that of men.

Graph 5.

Number of doctoral students enrolled 2018/2019 (left) and those awarded a doctorate 2021/2022 (right)



At higher-level studies, in all analysed faculties, the trend of women enrolling in master's studies relatively more frequently and in doctoral studies relatively less frequently was observed. Still, women prevail among students awarded master's degrees or doctorates at the Faculty of Mathematics (they outnumber men by 22% and 14%, respectively) and the Belgrade Faculty of Organisational Sciences (they outnumber men by 100% and 33%, respectively).

Labour Market

Although 59% of graduates in Serbia are women, they account for only 44% of those employed and under 10% of the top earners. Since lower value-added sectors are dominated by women, this indicates that a number of women do not transition into employment upon completion of studies (beginning of attrition) or quit employment in the IT sector at some point (continuation of attrition), most commonly owing to family commitments and a feeling of being isolated in a 'men's' sector. In addition, employed women advance their careers at a slower pace and in 'smaller steps' (further continuation of attrition, which increases as they progress up the career ladder). Women hold only 24% of directors' positions in Serbia, and the share of women who earn an income exceeding three times the average wage is below 10%. More specifically, only 3 128 women and ten times as many men – 31 625 – earn salaries above this threshold[21].

The gender imbalance is almost the most pronounced in the ICT sector, but considerably lower compared to an average EU Member State. Of the total employed ICT specialists, women account for 18.9% at the EU level, and 23.3% in Serbia[22]. The only EU countries with a share of women in ICT higher than in Serbia are Bulgaria (28.9%), Romania (25.2%), Estonia (24.5%) and Finland (23.8%)[23]. In contrast to this, women are the least represented in the Czech Republic (7.4%), Slovenia (9.2%), France (10.3%), Belgium (10.8%) and Poland (10.9%). Even in highly sensitized international companies, the percentage of women in technical positions is low – Apple (23%), Google (20%), Microsoft (17.5%)[24].

In STEM areas overall, women's share is especially high in Serbia, and they account for almost one half of employees (48%), which is very high having in mind that women account for 44% of total employment in Serbia. Nevertheless, it should be noted that the total number of employees in STEM areas is small – only one out of ten employees in Serbia works in these fields. In addition, 39% of those women work as support staff, rather than as researchers, and a significant number of women with STEM educational background work in schools as teaching staff[25].

Reasons for the more favourable gender situation in Serbia's ICT sector should be sought both in the more advantageous starting point, dating from the communist-socialist times, and in the favourable trend of the growing share of women in ICT in recent years.

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21 Tax Administration of the Republic of Serbia (2022).

22 This data is from Eurostat, in the interest of comparability with statistics on other countries. Different percentages are cited in domestic statistics, probably owing to differences in methodology or coverage. Specifically, the Statistical Office of Serbia's figure on women's share among ICT specialists stands at 21.6%.

23 Eurostat 2022, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_in_employment#ICT_specialists_by_sex

24 UNESCO (2019), I'd blush if I could: closing gender divides in digital skills through education - UNESCO Digital Library, available at: https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1

25 Available at: https://startit.rs/srbija-ima-43-zena-u-stem-oblastima-ali-su-placene-23-manje-od-kolega/

More specifically, in socialist times, women's share in the labour force, including STEM professions, was higher in Serbia than in Western European countries, primarily owing to the introduction of compulsory primary and lower secondary education for women, higher education scholarship schemes that prioritised women, implementation of adult education programmes and education via mass media[26]. In addition, the principle that 'the goal and tasks of socialist education do not make any distinction between members of the male and female sex' was communicated to teaching staff". However, although in the socialist period women pursued STEM education to a more significant extent, they sought careers in other sectors (e.g., education) more commonly than men, which is a pattern that has persisted until today. The favourable trend of women's representation in STEM professions is also observed in other countries with a communist legacy, such as Russia, Bulgaria, Romania, Lithuania, and others, but not in all.

The share of women in Serbia's ICT sector is increasing faster than in the EU. During 2021, the ICT sector in Serbia employed 50 000 people, of whom 16000 were women. Women's participation in Serbia's entire ICT sector (including women in non-technical positions) was over 32%[27] in 2021, significantly over the EU average (25%). In the period of 2017-2021, women's share in Serbia's ICT sector grew from 23% to 32%. At the same time, the increase of the share of women is intensifying, as only in 2021 women represented 40% of the total number of newly employed persons[28]. Looking only at women with ICT educational background, their share in the EU grew only by 2% in the period 2015 - 2020, from 14.7% to 16.7%, while it even decreased in 2021. More concretely, the number of men with ICT educational background increased during that same year by 6.8%, while the number of women decreased by 4.5%, lowering their share in this one year. With this, the share of women among the total number of employed with an ICT educational background in the EU declined from 17.2% to 15.9%[29].

The rise in women's participation in Serbia's ICT sector in recent years is encouraging, but further investments in women's resources are needed, since this sector will undoubtedly continue to grow. According to assessments from 2022[30], Serbia's ICT sector lacks 7000 people per year, while the education sector produces 4000 specialists per year[31].

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26 Tomišić, Vida (1981), Žena u razvoju socijalističke samouprave Jugoslavije (Women in the development of Yugoslavia's Socialist Self-governance), Jugoslovenska stvarnost, Beograd.

27 This is data from the study ICT in Serbia - At a Glance 2022, of the Vojvodina ICT Cluster, while similar data (33%) was also indicated through UNDP's research based on Linkedin profiles of women and men in Serbia, available at: https://www.undp.org/serbia/blog/can-linkedin-data-help-us-measure-glass-ceiling .

28 ICT in Serbia – At a Glance 2022, Vojvodina ICT Cluster, available at: https://voict-c1c3.kxcdn.com/wp-content/uploads/2022/12/ICT-in-Serbia-At-a-Glance-2022.pdf

29 Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddm-20221011-1

30 It should be borne in mind that in 2023 there was a decline in employment in the IT sector, but stable recovery is expected in the future, given that the layoffs in 2023 were mainly due to the rapid growth of the sector during the COVID-19 pandemic.

31 ICT in Serbia – At a Glance 2022, Vojvodina ICT Cluster, op.cit.

According to labour market data, even though the share of women among candidates applying for jobs in the ICT sector is increasing, their share in high-ranking positions is very low.[32] Most women apply for internships, while out of those already employed, as many as 55% are juniors, 43% – mediors and only 2% – seniors. Despite women's growing share in the ICT sector, the fact that they stay in junior positions longer should not be disregarded. More specifically, 30% of women aged over 35 are still in junior positions, while as many as 85% of men aged 25–34 are in senior positions.[33] The share of women decreases with progress up the corporate ladder. Women account for only 17% of managers in the ICT sector, while the corresponding share for the overall economy stands at 32%.[34] In directors' positions in the ICT sector, the share of women is below 10%.[35] On the other hand, global research shows that closing the gender gap in leadership positions in the global ICT sector could contribute to raising the global gross domestic product (GDP) by 0.5–0.6%.[36]

Within the ICT industry, the gender gap is the narrowest in areas related to information services (data processing, hosting and web portals), while technology-related areas (programming, ICT consulting, management of computer equipment) are notably dominated by men.[37] However, this trend is slowly changing, as recent data indicate that nowadays women most commonly apply for: Quality Assurance, Software Developer, IT Project Manager, Automation QA Engineer and Java Developer positions. Organisational and soft skills encourage women to apply for IT project manager positions to a greater extent. Nevertheless, women account for less than one fifth of those employed in all managerial positions in the ICT sector.[38]

The top three factors in choosing a job in the ICT sector are the same for men and women – flexible hours, work from home, and education and training. As regards factors affecting job change decisions, the salary level is the top-ranked factor for both men and women. On the other hand, working with new technologies is ranked second for men, and only fourth for women, while work-life balance is ranked third for women, and fourth for men.[39]

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32 Puls srpske IT zajednice (Pulse of the Serbian IT community), 2022, survey conducted by the website HelloWorld.rs, available at: https://www.helloworld.rs/blog/Puls-Srpske-IT-zajednice-Prosecna-plata-programera-i-do-tri-puta-visa-od-prosecne-plate-u-Srbiji/13732.

33 Article written as part of the project Media and Youth for Democratic Development': https://rb.gy/onb04n

34 Startit (2019), Istraživanje programerske scene u Srbiji (Research on the programmers' scene of Serbia) https://startit.rs/17-rukovodecih-pozicija-i-20-manja- plata-jos-uvek-smo-daleko-od-rodne-ravnopravnosti-u-it-u

35 Gender Equality Strategy 2021–2030, http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2021/103/1

36 Dalberg (2016), Decoding diversity: the financial and economic returns of diversity in tech - Dalberg

37 Gender Equality Index for the Republic of Serbia 2021 (https://socijalnoukljucivanje.gov.rs/wp- content/uploads/2021/10/Gender_Equality_Index_for_the_Republic_of_Serbia_2021.pdf)

38 Startit (2019), Istraživanje programerske scene u Srbiji, op.cit.

39 Puls srpske IT zajednice, op.cit.

Among ICT sector business owners, men dominate heavily. Over 75% of business owners, as well as business representatives in ICT activities are men. Looking at companies only, men are owners of over 80% – out of 5 700 companies, 4 900 are majority-owned by men, and the situation is hardly any better with regards to sole proprietorships – men account for slightly under 80% of the owners, with over 14 800 sole proprietorships owned by men, out of the total of 18 780. Moreover, if only those sole proprietors whose economic activity is 'computer programming' are taken into consideration, over 85% are men. As regards performance, an average man-owned company earns almost twice as much as a woman-owned one, and almost three times more in case of sole proprietorships.[40]

In the digital gig economy[41], the gender structure is favourable from the quantitative aspect, but not from a qualitative one. Women account for over one third of the workers (38%), however, while men mainly work on software development, women most commonly perform administrative and translation work.[42] Statistics for ICT jobs only are not available. The most common motive cited by women for working on online platforms is flexible hours, followed by professional development.[43]

Pay Gap[44]

The pay gap is present in all countries worldwide and, at the current pace, it will take 257 years to close it.[45] It is the smallest in Luxembourg, Romania, Poland, Italy and Slovenia, and the greatest in Estonia, Austria, Germany.[46] In the average EU country, the pay gap stands at 12.7%,[47] while in 2018 it was 14.4%. In Serbia, however, the gender pay gap is increasing – in 2022 it stood at 14.4%, while in 2018 it was 9.6%. While data are not internationally comparable after 2018, due to methodological differences, there is indeed a trend of increasing pay gap in Serbia, and this gap is even greater when earnings are analysed by education levels or occupations.

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40 Data of the Cube Team agency, 2021, used for the purpose of this research.

41 The gig economy is a form of economy encompassing temporary, independent contractor jobs or engagement on a short-term basis, often via online platforms. The digital gig economy is the segment of the gig economy specifically linked to digital technologies and online platforms. In the digital gig economy, workers use digital platforms, such as applications and web pages, to provide different services or perform work. The digital gig economy entails certain advantages and challenges. Advantages include greater flexibility and self-employment opportunities, wider availability of jobs via online platforms, global labour market, simpler communication, and payment, as well as the possibility of remote work. However, challenges include income insecurity, lack of social protection and labour rights, as well as the issue of regulation and protection of labour rights in the digital environment.

42 Šta za HelloWorld.rs kažu žene u srpskom IT-ju: Nejednake šanse, isti ciljevi | HelloWorld.rs

43 Statistical Office of the Republic of Serbia (2021), Gender Equality Index for the Republic of Serbia, op.cit.

44 The gender pay gap is defined as the difference between men's and women's average gross hourly pay.

45 Available at: https://news.un.org/en/story/2022/09/1126901

46 Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics#Gender_pay_gap_levels_vary_significantly_across_EU

47 Eurostat (2023), available at: Gender Pay Gap in the EU remains at 13% (europa.eu)

In the USA, the data for the past five years show that the pay gap has remained unchanged and is 20% less. The part of the pay gap attributed to skills disparities between men and women has largely been eliminated. However, the pay gap that persists is a result of household dynamics and birth of children. Despite their growing contribution to household income, women still take on a larger portion of childcare duties, hindering their advancement and leading to a growing pay gap with age.[48]

The pay gap is more pronounced in ICT jobs in Serbia than in most other occupations. It stands at 9.1%[49], while in the EU it was 14.8% in 2018[50]. As an illustration, looking at ICT specialists only, women ICT specialist work for free from 28 November onwards until the end of the year. Only 15% of women in Serbia's ICT sector earn over EUR 2 000 per month, while almost twice as many men have achieved this level of earnings. On the other hand, as many as 40% of women earn under EUR 1 000[51]. The pay gap is pronounced even in large international companies that have the duty to publicly report on its size. Interestingly, there are substantial differences among companies – Amazon (<1%), Microsoft (7%), Facebook (8%), Twitter (13%), Google (15%), TikTok (30%) and Snap (53%).[52]

As regards freelancers, the pay gap is more pronounced and has even increased in the past two years. In Serbia, women account for 38% of freelancers and, on average, are better educated and lower paid. The average hourly wage for men freelancers is 20.9 USD, while the average hourly wage for women freelancers is 18 USD, which means that women earn 16% less than men. Additionally, women are less likely to increase their hourly rate compared to men, and will rather choose to decrease their costs than to increase the price of their services. Therefore, women freelancers' income increases slower with time, compared to the income of men freelancers. The situation is similar worldwide, with the highest pay gap recorded in North America, while women freelancers earn more than men only in South America, by 18%, probably under the influence of higher-paying industries that are in higher demand in the region. A positive trend, on the other hand, is the fact that the share of women freelancers is on the increase across the world. In two years alone (from 2020 to 2022), it grew from 24% to 29%, which is probably partly a result of the pandemic.[53]

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48 Available at: https://research.stlouisfed.org/publications/employment-research/will-the-gender-pay-gap-get-smaller

49 Gender Equality Index of the Republic of Serbia 2021, Statistical Office of the Republic of Serbia, 2022, op.cit.

50 Gender Equality Index 2020, EIGE, available at: https://eige.europa.eu/publications/gender-equality-index-2020-report/gender-pay-gap-ict-and-platform-work#:~:text=Despite%20recent%20policy%20actions%20at,men's%20(Eurostat%2C%202020).

51 Puls srpske IT zajednice, 2022, op.cit.

52 Available at: https://www.bloomberg.com/news/articles/2022-04-06/snap-has-53-u-k-gender-pay-gap-men-dominate-tech-high-earners#xj4y7vzkg

53 Payoneer (2023), available at: "https://discover.payoneer.com/businesses/freelancer-insights-report-rs"

Education

According to the findings of the two largest-scale surveys into girls' interest in STEM (Microsoft surveys in Europe[54] and the USA[55]), girls suddenly begin to lose interest in STEM occupations at the age of 11–12. It is precisely at this age that girls begin to lose confidence and their self-perceived competence declines[56], which coincides with the physiological changes experienced at that age. Given that the choice of secondary school and elective subjects is made between 15 and 16 years of age, there is a very short window (about 4 to 5 years) for efforts to sustain their interest in STEM. While loss of interest also occurs in respect of social sciences, it is restored faster and to a greater extent in those areas.

According to available surveys, we can identify six key reasons why girls are less likely to choose STEM, in order of importance:

1. **Stereotypes:** From early childhood, children are exposed to stereotypes in their environment – at home, in daycare, in parks etc. Already between the ages of 2 and 5, ideas of gender-stereotypical occupations begin to develop in children[57], and at the age of five, they have formed the prejudice that boys are better at mathematics and like it more[58]. According to the PISA (Programme for International Student Assessment) survey[59], 16% of boys and only 3% of girls believe that they will be in an ICT occupation at the age of 30, as girls believe that they are not talented and intelligent enough for those occupations ('impostor syndrome') and that those occupations are more suitable for boys.

54 Available at: https://onedrive.live.com/view.aspx?cid=089f9bc9ce672ff4&id=documents&resid=89F9BC9CE672FF4!108&app=WordPdf&authkey=ANK-QohgdrHsqJg&

55 Available at: https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE1UMWz

56 Sáinz and Eccles (2012), Self-concept of computer and maths ability: gender implications across time and within ICT studies. Journal of Vocation Behaviour 80, 486–499, available at: https://doi.org/10.1016/j.jvb.2011.08.005.

57 Barth, J., Kim, H., Eno, C., Guadagno, R., "Matching Abilities to Careers for Others and Self: Do Gender Stereotypes Matter to Students in Advanced Math and Science Classes?", Sex Roles: A Journal of Research, 2018, 79(1–2), pp: 83–97, available at: https://doi.org/10.1007/s11199-017-0857-5.

58 Del Río, M. F, & Strasser, K. (2013). "Preschool children's beliefs about gender differences in academic skills"Sex Roles: A Journal of Research , 2013, 68, pp. 231–238, available at: https://doi.org/10.1007/s11199-012-0195-6.

59 PISA (2018), available at: https://www.oecd.org/pisa/publications/pisa-2018-results.htm

There is also the 'stereotype threat'[60] – girls fear that their performance will confirm the negative stereotypes associated with them, which results in lower performance in reality ('self-fulfilling prophecy'[61]) Finally, both men and women hold the stereotypes that ICT occupations are a) narrowly focused (programming only), b) difficult and time-consuming, and c) suitable only for the extraordinarily smart, while the typical IT professional's persona is a 'young man who sits in front of a computer all day and has no other interests'. On the other hand, one of the numerous surveys conducted by Carnegie Mellon University[62] has shown that in reality, neither male nor female students at that university match this persona and that it is only stereotypes that discourage women from studying computer science. Given such strength of the stereotypes, it is worth noting the counter-stereotypes that may, in fact, help attract girls into ICT occupations. A survey on the importance of female role models for girls has shown that it is also essential to have female role models communicate to girls about the importance of counter-stereotypical skills for working in the ICT sector (teamwork, communication, and other soft skills), as these are the skills in which girls have a self-perceived advantage. More precisely, girls do indeed have an advantage over boys in these skills, but are not aware that they are required in ICT occupations and that they are increasingly in demand. It is precisely because of these skills that girls are less likely to choose computer science, even when they are highly talented in mathematics, while those who are strong in mathematical skills, but not in communication, are more likely to choose computer science, and those are predominantly boys.[63]

2. **Lack of female role models:** Girls and women need more exposure to STEM occupations in early childhood, in the form of female role models in their immediate environment (family or school), as in that case the likelihood of choosing a STEM profession is higher. Having a role model is more important for girls than for boys. However, according to the Microsoft survey in Europe, 64% of girls do not know any women in STEM professions, while on the other hand, another survey[64] shows that girls' interest in STEM rises by 20–30% after targeted sessions with successful women from STEM professions. There are many similar initiatives worldwide and all have shown that role models are more important for girls than for boys, for several reasons: they reduce stereotypes, encourage interest in STEM, broaden their horizons and highlight their potential, and finally motivate them to actually choose STEM (by demonstrating a higher probability of success and contribution they can make).

3. **Lack of practical work:** Girls who had more practice in education – either in or outside classes (e.g. in STEM clubs) – are more likely to choose STEM subjects in secondary schools and better understand STEM jobs they can pursue in the future. However, 39% of girl respondents in the Microsoft survey in Europe stated they did not have enough practice. Creativity, as a predominantly 'female trait', in the classroom is also crucial in encouraging interest in STEM among girls.

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60 Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. Journal of Personality and Social Psychology, 69(5), 797–811, available at: dostupno na: https://doi.org/10.1037/0022-3514.69.5.797.

61 Midlarsky, Elizabeth, Rosenzweig, C., Self-fulfilling prophecy and gender, 2018, dostupno na: https://rb.gy/ndr0om.

62 Fisher, A., Margolis, J., Miller, F., Undergraduate Women in Computer Science: Experience, Motivation and Culture, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213, 1998.

63 Wang, M., Eccles, J., Kenny, S., "Not Lack of Ability but More Choice", Psychological Science, 2013, 24(5), pp. 770–775, available at: https://doi.org/10.1177/0956797612458937.

64 González-Pérez, S., Mateos de Cabo, R., Sáinz, M., "Girls in STEM: Is It a Female Role-Model Thing?", Frontiers in Psychology, 2020, 11, Article 2204, available at: https://doi.org/10.3389/fpsyg.2020.02204.

Finally, exposure to technologies from the earliest age also plays an important role, as girls then feel better prepared and more competent for STEM occupations. It is precisely for this reason that the number of girls enrolling in ICT courses of study suddenly began to decline in the mid-eighties, as computers began to be advertised as 'boys' toys' and boys had more opportunities to familiarise themselves with using them.

4. **Lack of support from teachers, peers, and parents:** More than a third of girls (35%) who participated in the Microsoft survey stated that they did not feel any support from teachers or peers. Moreover, 21% stated they did not feel comfortable to ask a question in STEM classes, as they felt they were the only ones who did not understand the contents. A survey conducted in Croatia[65] has shown that in primary school mathematics classes, only 30% of commendations are addressed to girls, and 70% to boys. In addition, parents do not support girls' orientation towards STEM, while the Microsoft survey shows that girls who have their parents' and teachers' support are twice as likely to choose computer science in secondary school and three times as likely to choose this field as their principal course of study at university. Mothers' support is especially important since they are girls' first role models. If mothers do not transmit prejudice about 'men's occupations' to their daughters, those girls perform better in STEM subjects, despite the 'stereotype threat'.[66]

5. **Lack of (perception of) equality.** Perceived inequality is even higher than actual inequality in the ICT sector; thus, girls are sceptical when it comes to the treatment they would receive in STEM occupations and this also discourages them from pursuing these occupations.[67] There is a strong perception that STEM fields are dominated by the 'male culture' and girls do not feel that they belong there.[68]

6. **Lack of motivation and inspiration.** When girls know more about STEM jobs and how creative they can be, their perception of the creativity of STEM occupations increases twofold. Likewise, they will be more likely to choose jobs that they believe can make a positive contribution to addressing societal problems; therefore, they need specific examples – 72% of girl respondents in the Microsoft survey stated they would like to do a job that would help the world. When it comes to computer science, the perception that it boils down to 'dry programming' discourages girls, since they want 'programming with a purpose'; hence, the broader picture must be communicated to them.

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65 Institute Mode1 (2021), project Kindle Equality

66 Tomasetto, C., Alparone, F. R., & Cadinu, M. (2011). "Girls' maths performance under stereotype threat: The moderating role of mothers' gender stereotypes". Developmental Psychology, 47(4), 943-949.

67 Microsoft (2017), Why Europe's girls aren't studying STEM (available at: https://rb.gy/gtggnp)

68 Cheryan, S., et al., "Why are some STEM fields more gender balanced than others?", Psychological Bulletin, 2017, 143(1), pp. 1-35, available at: https://psycnet.apa.org/doiLanding?doi=10.1037%2Fbul0000052.

Labour Market

All the above reasons spill over into the labour market. In addition to the fact that women are outnumbered by men at the point of entry into the ICT industry, research shows that women in this industry are more likely to quit than in other industries, most frequently in the first several years of their career.[69] The key reasons cited include a lack of female role models, male culture and unequal treatment in companies, as well as a high workload, which makes it impossible to commit to the family sufficiently. Given the high attrition in early career years and slower advancement for women who remain in the sector (compared to men), senior positions in the ICT sector are heavily dominated by men.

Below are outlined the key factors that have an additional impact on women's lower representation in the ICT industry after the completion of studies and in particular in managerial positions, which is increasingly pronounced with progress towards the top of the career ladder. The reasons are presented in order of importance:

1. **Lack of female role models and mentors in companies.** Women role models and mentors are especially important for women at the beginning of their careers, as in predominantly male environments such models demonstrate that success is possible and foster a sense of belonging in the company. Women in technological sectors and, in particular, in senior positions are often the only women in those roles, which makes them feel especially isolated. For instance, a McKinsey research on women in the workplace shows that one out of three women in technological positions is an 'only' woman, while in all industries overall only 5% of men are in such positions; at the same time, women in this position are more discriminated against than men.[70] Research shows that women are more likely to become executives if the companies they work for already have a woman executive.[71]

2. **Male-dominated environment and 'male culture' in companies.** Owing to all of the mentioned stereotypes and the fact that ICT companies are dominated by men, they are usually permeated by a 'male culture' that makes women feel unwelcome. A survey encompassing 654 companies in the USA has shown that this is the main reason why women quit jobs in the ICT sector.[72] Research also shows that companies that have women in leadership positions already from their foundation have a more developed culture of diversity and inclusion (and thus also a higher level of diversity), since they build and foster it from the very beginning.

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69 However, half of these women continue using their technological skills in other jobs. (https://www.womenintechnetwork.com/retention/, accessed December, 2022)

70 Mc Kinsey (2019), Women in the workplace, available at: https://wiw- report.s3.amazonaws.com/Women_in_the_Workplace_2019.pdf

71 Available at: http://www.webershandwick.com/uploads/news/files/female-ceo-reputation-premium-executive-summary.pdf

72 Available at: https://www.forbes.com/sites/elenakvochko/2016/01/04/women-executives-in-tech/?sh=52c389cc55e7

This is the reason why some companies deliberately appoint women to leadership positions and practise positive action for women's employment, to break the vicious cycle of the low number of women in technological positions and low interest in these positions among new female candidates, or short spells of women in these positions.

3. **Expectations in terms of care for children, home, and family.** In connection with the previous argument, in patriarchal societies, there is a clear expectation that the woman should perform most of the unpaid care work in the home and family. Achieving equality between women and men in this domain will take an infinite amount of time, according to the Gender Equality Index. The burden of household chores is the highest in the first decade of career, as women who are married and have a child/children aged up to seven spend the most time doing unpaid work, in fact, as much time as they spend doing paid work (one full shift)[73]. As many as 96% of women in Serbia and only 4% of men cite family care as the reason why they do not work full-time.[74] One out of two women in Serbia (54%) cites family responsibilities as the key reason for not pursuing additional education during her career, compared to only 35% of men.[75] Also, a significantly higher share of women decline business trips or professional training compared to men (30% of women compared to 15% of men). Slightly more women than men receive lower pay due to the inability to complete professional responsibilities (20% vs. 15%). [76]

4. **Community and family pressure.** Upon finishing ICT studies, owing to the pressure from their family and immediate environment, women are more likely than men to choose sectors that offer better possibilities for reconciling professional and family life, rather than the ICT industry. Thus, women are less likely to choose to work in the industry from the outset and especially less likely to progress to higher-ranking positions which entail more responsibility and are more time-consuming.

5. **Lack of confidence.** Despite better academic performance, girls who complete ICT studies are less likely to pursue a career in the ICT industry owing to lower self-perceived capabilities for working in the industry. It is precisely because of this self-criticism and perfectionism that women decide to apply for jobs less frequently than men. A LinkedIn survey shows that women are 16% less likely to apply for a job after seeing an advertisement and, overall, apply for 20% fewer jobs than men. However, contrary to the popular theory that women only apply for jobs when they meet 100% of the criteria and men – when they meet 60%[77], more thorough surveys show that such differences are almost non-existent. A 2019 survey by BI Team[78] shows that there is no difference among high-skilled candidates and only a slight difference among low-skilled ones, where women apply for a job if they meet 56% of the criteria, and men – if they meet 52%.

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73 UN Women Serbia (2019), Ekonomska vrednost neplaćenog rada u Srbiji (Economic value of unpaid work in Serbia).

74 RZS (2016), Anketa o radnoj snazi (Statistical Office of the Republic of Serbia - Labour Force Survey).

75 Eurostat, 2016.

76 Poverenik za zaštitu ravnopravnosti (2022), HYPERLINK "https://ravnopravnost.gov.rs/wp-content/uploads/2021/10/Istrazivanje-Wobaca-FINAL-Srb.pdf"Istrazivanje-Wobaca-FINAL-Srb.pdf (ravnopravnost.gov.rs)

77 This figure is cited by Sheryl Sandberg in her book Lean In, and also often referred to by credible sources such as McKinsey, HBR and Forbes; however, the investigative journalist Curt Rice has concluded that the figure originates from a comment made by a senior manager of Hewlett Packard, source: https://rb.gy/ yxog02

78 Available at: https://www.bi.team/blogs/women-only-apply-when-100-qualified-putting-received-wisdom-to-the-test/

The factors owing to which women are less likely to apply for jobs primarily include the facts that: women apply for senior positions less frequently owing to the greater responsibilities and time demands that they entail and only partly because they perceive them as predominantly male; women more frequently seek part-time and flexible arrangements, which are fewer among all job advertisements; they have less time to send applications owing to family responsibilities. According to the University of Chicago economist Marianne Bertrand, only 10–15% of gender disparities in labour market outcomes are attributable to psychological differences such as risk aversion, confidence or competitiveness.[79] However, in practice, that men attain higher-ranking positions with relatively lower qualifications, is illustrated by the famous quote of Maureen Reagan, daughter of Ronald Reagan: *'I will feel equality has arrived when we can elect to office women who are as incompetent as some of the men who are already there.'*

6. **'Perception gap'.** The McKinsey research on diversity shows that fewer men than women recognize the challenges faced by women in the workplace and in career advancement. 93% of women and only 58% of men agree with the statement that it is more difficult for women to attain top management positions even with equal skills and qualifications.[80]

The causes of the pay gap are numerous and correspond to the mentioned reasons for women's lower share in the ICT sector, especially in managerial positions. More specifically, they are as follows: women negotiate a lower salary at the outset of their career (by EUR 200 in the ICT sector[81]); are less likely to request a raise and have weaker negotiation skills; are less likely to receive a promotion; have a smaller circle of contacts due to the lack of time for networking; have career downturns and breaks owing to childbearing and, subsequently, child care responsibilities; and finally – women's work is perceived as less valuable. As women enter a male-dominated industry, the average earnings in that industry begin to decline, and vice versa. For instance, from the 1950s to the early 2000s, more women entered the design sector and the average earnings dropped by 34%, while more men entered the ICT sector and the average earnings increased[82].

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79 Available at: https://www.bi.team/blogs/women-only-apply-for-jobs-when-100-qualified-fact-or-fake-news/

80 McKinsey research on diversity, available at: https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/why-gender-diversity-at-the-top-remains-a-challenge

81 Survey conducted by the website Poslovi Infostud (2022), available at: https://poslovi.infostud.com/vesti/ZENE-U-SRBIJI-Obrazovanije-a- ocekuju-manju-platu/56075

82 Miller, C (2016), As Women Take Over a Male-Dominated Field, the Pay Drops (https://rb.gy/qx2kgk).

Recommendations to Improve the Gender Balance

The existing literature points to the following recommendations to promote and sustain girls' interest in STEM and, specifically, ICT occupations:

- Make female role models more visible and ensure their direct contact with girls.
- Encourage parents and teachers to support and encourage girls to choose ICT, and to mentor them along the way.
- Support teachers to develop strategies for encouraging students to ask questions, make mistakes and seek assistance when they need it.
- Educate preschool and school teachers and parents (especially mothers) about the unconscious stereotypes that they hold and unconsciously transmit to children (e.g., about 'men's' and 'women's' occupations).
- Support extracurricular STEM activities that increase the level of girls' interest in STEM, as well as boost their confidence in their own capacities to be successful in these areas.

Russia - a Good Practice Example

The Microsoft survey in 12 European countries shows that Russia has the highest proportion of girls who say they see themselves in a STEM profession in the future. In Russia, interest in STEM appears a year earlier than in other countries, i.e., at the age of 10. Over 60% of girls in Russia report that both teachers and parents frequently talk to them about and encourage them to pursue STEM occupations, while, for instance, such support is missing most notably in Slovakia and the Czech Republic, although these are also former communist countries. Likewise, more than half (55%) of Russian girls reported having female role models that encourage them, while in the Netherlands only 35% agreed with this statement. Russia also leads the way in the presence of practical instruction in schools, with a similar situation in Poland and Slovakia, The higher interest in STEM among girls in Russia is probably also aided by the curriculum, perceived by girls as gender-neutral, which is also the case in Finland. In addition, in Finland over 60% of girls state that they understand how relevant STEM topics are for life and their future careers, and the PISA survey has shown that Finland is the only country where girls perform better than boys in science.

- Ensure practical experiences and introduction to diverse real-world examples.
- Make STEM subjects gender neutral. Emphasise the creative aspects of ICT and introduce them to students through examples, practical work and competitions (e.g., hackathons).
- Foster the growth mindset among girls/women, as they are more likely to have a fixed mindset owing to the limiting stereotypes.
- Instil trust among women and girls in equal treatment in STEM areas, since perceived inequality is higher than actual inequality.
- Brand ICT occupations as gender neutral.

- Emphasise the broader aspect and contribution of the ICT sector to the world.
- Stress the (growing) importance of soft and other 'women's' skills in the ICT sector, to make girls/women feel more welcome.
- Listen to the needs and challenges faced by girls/women.

The additional recommendations applicable only to gender equality at work primarily concern measures related to family and women's work-life balance[83], as well as narrowing the pay gap:

- Create female role models and mentors within companies;
- Appoint women to leadership positions already from the company's foundation;
- To increase the number of women in managerial positions, ensure substantive inclusion of women and equal treatment in lower-ranking positions;
- Work-life balance schemes – flexible working hours and possibilities for part-time work;
- Schemes to facilitate taking up and returning from maternity leave;
- Additional paid parental leave, provision of childcare or home assistance services;
- Employee performance appraisal systems regardless of maternity leave;
- Synergy between the state and the business sector to eliminate the pay gap[84].
- As regards women sole proprietors, it is essential that the state equalise their status with that of employed women with regard to pregnancy and maternity leave, rather than with unemployed women, as is stipulated by the currently applicable legal provisions.[85]

The cities with the best prospects, where the implementation of the above recommendations would have the highest impact, are Belgrade, Novi Sad, Niš, Kragujevac, Zrenjanin, and Subotica as an emerging opportunity.

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83 Deloitte (2021), Žene u poslovnom svetu, (Women in the world of business) https://www2.deloitte.com/content/dam/Deloitte/rs/Documents/about-deloitte/SheXO_SRB_Brochure_2021.pdf

84 Even though pay parity is legally regulated in Serbia, the state can further support the reduction of the pay gap through family-oriented policies (which would contribute to improving the balance of unpaid work) and through stipulating a requirement for companies to report on the pay gap, accompanied by penalties for non-compliance with the 'equal pay for equal work' principle. Regarding the latter, good practice examples can be found in countries such as Iceland, Germany and United Kingdom, which have introduced such requirements in recent years. What companies should do is to adopt gender equality policies, establish pay grades that are complied with irrespective of sex and pay level sought by new recruits (given that, on average, women ask for lower pay), and finally form gender equality committees to monitor the implementation of these policies.

85 Initiative I preduzetnice su mame (Sole Proprietors Are Mothers Too), https://peticije.kreni-promeni.org/petitions/i-preduzetnice-su-mame

The first five cities are the seats of the key faculties offering ICT-related courses of study – in Belgrade, these include the Faculty of Electrical Engineering, School of Computing, Faculty of Mathematics, Faculty of Organisational Sciences, and College of Electrical Engineering and Computer Science; in Novi Sad – Faculty of Technical Sciences; in Niš – Faculty of Electronics; in Kragujevac – Faculty of Science and Mathematics; in Zrenjanin – Mihajlo Pupin Technical Faculty. In addition, an ICT cluster was established in Zrenjanin in 2016 with the aim of putting the city on Serbia's map of ICT centres. These cities also have a developed ICT industry, including both domestic companies and branches of international ones. Subotica, on the other hand, is a city whose ICT potential has yet to develop. The organisation IT Subotica 2030 has been established in the city, at the initiative of Subotica-based ICT companies and education institutions, with the intention of turning Subotica into a recognizable regional ICT centre. As regards talents from other cities and smaller communities, there is currently no systemic solution, although the Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024 recognizes the issue of lower digital literacy in rural areas and proposes training delivery to address this problem, which is one of the causes of lower participation of girls from rural areas in the IT sector.[86]

Conclusion

Women's share in the ICT sector is higher in Serbia than in most other European countries, as seen in official data and various surveys. However, despite the increasing level of gender equality and the growing interest in this sector among both men and women, the gap in talent offer and demand persists. Owing to the lack of statistics, it is unknown how many and what profiles of ICT talents Serbia is actually lacking. Moreover, there is no official data on gender equality in different subsections of the ICT sector and different levels of managerial positions, or on the pay in these sections. Further, the causes of the more favourable gender balance in Serbia's ICT sector compared to most European countries are insufficiently clear, although they may be assumed to be a result of the socialist legacy. Based on the the available statistics and research it can be concluded that women are less likely to choose ICT occupations even after finishing ICT studies, less likely to stay in them and advance their careers at a slower pace compared to other sectors. However, the causes of this phenomenon are not clear since there has been no research into this topic in Serbia and comparable countries (most research concerns Western countries). It is, therefore, essential to seek in-depth and detailed insights about these issues from ICT sector employees, through questionnaires and in-depth interviews with women working in the ICT sector, as well as women alumni of technical faculties.

86 Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024, op.cit.

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