Gender Inequalities in the Digital Domain. Bulgaria in a Comparative Perspective

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Abstract: This study is in line with the vision formulated in the EU regarding the need to implement targeted gender-equality policies, as reflected in the Gender Equality Strategy 2020–2025. The Strategy focuses on various aspects of gender equality which have the capacity to decrease the gender pay gap and to increase women's participation in training in science, technologies, engineering and mathematics (STEM). The research focus is on Bulgaria, where the share of women in the field of STEM and working in ICT sector is at the highest level among EU countries, but where there is an alarming downward trend of girls studying STEM disciplines, a problem that requires deeper investigation. The research interest is on occupational groups in the ICT sector, and specifically on an analysis of their willingness to undergo additional training. This paper applies in a comparative perspectivea gender-sensitive approach based on quantitative data. In addition two case studies are analyzed, which illustrate the obstacles to and chances for women's entrepreneurship, as well as the strategy of changing an initial occupation for a better career in the ICT sector.

Keywords: gender, entrepreneurship in ICT, adult education

Introduction

According to the Gender Equality Index (2020)[2], the average gender-based differences in the EU with regard to skills and use of skills are insignificant: with regard to skills in solving concrete problems and performing tasks, the difference is seven percentage points; for skills above basic and skills in software use, the difference is five additional percentage points for men. With regard to inclusion in training, women have four percentage points less than men.

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[2]The Gender Equality Index 2020 focuses on digitalisationand is elaborated in European Institute for Gender Equality (EIGE) , https://eige.europa.eu/news/gender-equality-index-2020-can-we-wait-60-more-years https://eige.europa.eu/gender-equality-index/thematic-focus/digitalisation/country

Considerable inequalities between men and women appear in segregation and separation first in education and then, as a consequence, on the labor market. Overall,across the EU, men and young people dominate in the development of new technologies. Women represent 20% of graduates in ICT, have the lower share (17.7%) among ICT specialists, and represent 20% of the scientists and engineers in the high tech sector. The ICT sector offers better chances for achieving equal pay between men and women, stands at 11% in that sector, while the EU average for all sectors is 16%. There is a gender gap in the ICT sector as regards part-time employment, which is 16.5% for women and 5.4% for men (EIGE 2020 Gender Equality Index). There are economic and social reasons in the justice perspective for the inclusion of people of different ages and genders in the ICT sector. It would enlarge the pool of human capital involved in innovations and in work with higher added value.

On the Digital Economy and Society Index (DESI)[3]and the indicator for human capital, Bulgaria occupies the highest position only with regard to the share of employed women working in the ICT sector. This makes Bulgaria an outstanding and interesting case. The tendency, however, is for the largest decrease of women in the ICT sector precisely in Bulgaria, while in most European countries the trend is contrary: for a rise in the share of women in that sector[4] and studying STEM.

From 2017 to 2020, Bulgaria registered a decrease of the share of women graduates in ICT by 38 percentage points, down to 25%. Countries like Denmark, Sweden and Greece show, by contrast, a growth of the respective share by the same percentage. Austria presents a rise from approximately 0% of women in that sector to 15% during the same three-year period. What are

[3]The Digital Economy and Society Index, 2021

[4]The Norwegian embassy's report "The ICT workforce in Europe and the Gender Challenges after Covid-19", prepared by WomenGoTech, the first NGO mentorship and consulting program for women in Lithuania https://womengotech.com/app/uploads/2021/09/ICT-workforce-in-Europe-and-its-gender-challenge.pdf

the mechanisms that lead to a reduction in the number of women and the motivation for young women to study in specialties that orient them to work in the ICT sector? Do women take advantage of the possibility to change their educational profile and find jobs as programmers? What are the social mechanisms that motivate women's entrepreneurship and what are the obstacles that lead to the low participation of women as entrepreneurs and among the startups in the ICT sector?

The reasons for seeking a greater variety of workers in the ICT sector are related both to justice and to economic advantages. Enlarging the circle of people undergoing training and being hired is a goal based on economic considerations. Justice requires abolishing social barriers in terms of stereotypes influencing the choice of education and a profession suitable for men and women, but also requires eliminating discrimination in the choice of staff hired for work in the fastest-growing sector in Bulgaria.

The case of Bulgaria

The Bulgarian Association of Software Companies Annual Report for 2022 on the development of the software sector in Bulgaria[5] shows the most rapid of all growths was in this sector. There is practically no industry in which new software systems are not being implemented. An increasing number of professions require creativity and digital skills. Eighty percent of the sector in Bulgaria works for export. Despite the COVID-19 crisis, the growth of income in 2021 was by 20.2%. The sector's share of revenue in the GDP of Bulgaria grew from 2.1% in 2015 to 4.5% in 2021. In 2020, more than 40,000 people were occupied in the software sector. The new jobs have been growing by 12% a year on the average. The mean monthly

[5]BASSCOM Barometer 2022
https://basscom.org/RapidASPEditor/MyUploadDocs/BASSCOM_Barometer_2021_BG.pdf

remuneration is three times higher than the average for the country. In 2021, it was 3.2 times higher. It is expected that the remuneration of software engineers, corrected for living standard, will continue to exceed the average levels of pay in Germany and Great Britain.

The number of people occupied in the sector has grown ten times in 20 years. However, data on the composition and the working conditions in the sector are limited. In 2012, a document entitled "Strategic requirements of the software industry for a reform of the education system", elaborated for Bulgaria, declared the ambition to work with all stakeholders[6]. Among the envisaged measures is "facilitating and accelerating the procedures for 'import' of software specialists from abroad"; "engaging Bulgarian specialists returning from abroad"; "sharply increasing the quality of training of mathematics in school for *all* children" (2012:26). The emphasis on "all" is in the document itself, and a separate, important problem of education has been referred to only with this single word: the problem of equal access to education that gives better possibilities for work in a fast-developing sector of the economy. The "Strategic requirements of the software industry for a reform of the education system" indicate as an example of good practices the program "Together in Class", which sets itself the goal that "every" child in Bulgaria should have access to quality education and to Jump Math, the innovative system for teaching mathematics, which, it is noted, has achieved "exceptional results for all children (2012:24). The requirements from 2012 are still valid and the focus in 2022 in the establishment of STEM laboratories in the schools does not sufficiently succeed to raise the motivation of students and the competence level of teachers in the process of ongoing digitalization.

[6]Strategicrequirementsofthesoftwareindustryforareformoftheeducationsystem.Version 1.0, 2012.BASCOM.

Gender mechanisms

Yuval Harari finds the history of gender puzzling. Although the patriarchal system is based on myths and not on biological facts, and despite the historical changes it has undergone towards greater equality, this system remains universal and stable (Harari 2011). Achieving a permanent change towards gender equality is a long process that requires changing the socially constructed roles and stereotypes, and overcoming the gender mechanisms that restrict women's access to work in the IT sector. The gender mechanisms are based on stereotypes and division of gender roles in ways not actually presupposed by the biological differences between men and women. Ahuja's (Ahuja 2002) model of the barriers womenface in the IT professions differentiates between 1/ social factors (social expectations/cultural values; work-family conflict) and 2/ structural factors (occupational culture, lack of role models, access to informal networks, lack of mentors, institutional structures).

Some important gender-specific mechanisms are those related to time (Stoilova 2009, 2012). This includes 1)the need for additional qualification (leaving this task for a woman's spare time may lead to women's underrepresentation); and 2) the need for time synchronization in globally operating firms. The newly adopted changes in the Bulgarian Labor Code, following an EU Directive in the field, which are in effect since August 1, 2022, are related to a number of new rights of workers and employees in connection with the labor contract. The changes concern the time of compulsory training during working hours; and a new type of leave from work for fathers of children aged up to 8 years. The time-related restricting factors of women's work remain, and every woman faces the challenge of negotiating with her employer the possibilities for flexible working hours, the autonomy to determine the start and end of the working day, the

synchronization of time among geographically dispersed teams, the participation in meetings after the end of working hours, and childcare paid by the state.

The significance of digital inequalities intercrosses and overlaps with a wide range of characteristics, both at the level of the individual (gender, ethnicity and age) and at macro-level (economic status and social capital). Differences between men and woman in access to the Internet have practically disappeared, but they remain with regard to the derived benefits, which differ depending on a person's social capital, educational attainment and possibilities for work. Contributing factors of these gender differences are social mechanisms related to: 1) gender-specific skills and content produced and disseminated through the Internet; 2) gender-specific work processes and jobs that require the use of digital technologies (Robinson et al. 2015). These mechanisms can be divided into three types: gender stereotypes, women's self-assessment, and professional realization.

Internet use corresponds to the social roles, the expectations of others, and the interests women have in their offline life. For instance, women are more inclined than men to use the Internet for social contacts and social support. The stereotypical feminine behavior and attitudes in society are reproduced in online use as well. Presentation in the Internet often reproduces gender stereotypes: men are depicted as strong and aggressive and women as physically attractive and passive. Studies on the difference in self-presentation between men and women in the Internet also emphasize another factor, concluding that women are more likely to underestimate their Internet skills than men, who are inclined to overestimate them (Robinson et al. 2015) . Professionally, women are much less represented than men as programmers in the IT sphere.

Discrimination is another important mechanism for the lower participation of women in the IT sector. A comparative study of employers and their preference to choose men than women for work in the IT sector has indicated the existence of discrimination against women in Bulgaria, Switzerland and Greece, but not in Norway (Bertogg et al.2020). In Bulgaria and Greece women have a larger share in IT occupations than in manual, male-dominated occupations, such as the profession of mechanics. Recruiters may assume that the more flexible IT jobs are more accessible for skilled women, leaving wider room for temporal and spatial flexibilization in IT companies. There is no discrimination in Norway for both occupations – mechanics and IT developers, because of well-designed equal opportunity policies applied in that country. In Norway, there is a widely applied legislation, and a high degree of normative acceptance, of gender equality, such as is lacking in the other three countries. The normative acceptance is essential for the effective implementation of the laws related to gender equality. Policies are able to change socially constructed gender roles in a grater extend when the normative consensus is established in the society.

There are relatively few women-owners of companies in the IT sector. And not many of these women succeed in becoming visible and serving as role models for other women. That is why the strategies used by women entrepreneurs can indicate for other women the ways to overcome the gender barriers that prevent women from even dreaming about having a business of their own in the fast-developing IT sector. Specialized training in ICT designed to the needs and obstacles before the small business enterprises , targeted at businesses managed by women gives ideas not only how women differ from men as owners and managers of such enterprises, but also how they can overcome existing barriers in the society or in their closest environment. The need for targeted training for women is due to the fact that they work primarily in small

businesses that can hardly afford to devote resources, such as money and time, for training their staff in digital technologies. Women owners are disproportionately few, and there are reasons for this, defined as gender-specific obstacles faced by women with regard to the use of digital technologies. Researchers on the topic have identified gender-specific obstacles related to the size of the company but also to how women respond to the obstacles that prevent them from introducing digital technologies and that must be dealt with before attempting to build a successful independent business. These obstacles may be grouped under several larger topics (Orser et al. 2019):

1. Preliminary conditions that female owners of firms lack: a suitable education; the necessary knowledge; habits of working with technologies; correct convictions – for instance, awareness that one need not have mastered coding in order to work with and introduce technologies; sufficient time, given the double burden of work and family obligations.
2. Access to services and ways of coping with the introduction of technologies: financial resources, compatibility with women's usual way of working, access to courses and training, sufficient connections and sufficient participation in social networks that discuss technological solutions and problems (women may feel embarrassed to ask for help for technical problems in groups in which most co-workers aremen).
3. Low expectations of achieving results: low expectations that technologies would improve the business results; women do not see technologies as a priority that would make them more successful.
4. Social obstacles: lack of role models; lack of focus in communication between women on the importance of technologies; the existence of traditional role models, where by women rely on others to make decisions.

5.Age as an obstacle to undertaking or learning something new. Digital inequalities are largely a generational problem, and gender-specific problems come in only second in as much as young women are able to surmount the technological barriers more easily than women of older generations.

6. Trust in one's own strength and potential.

7. Abilities, skills and qualification.

8. Willingness to take risks.

9. Lower expectations for success in a business of one's own. Feeling satisfied with what one has achieved and insufficient striving to develop, including through the implementation of new technologies.

10. Characteristics of the firm and the sector in which the firm is operating.

This article analyses the impact of these barriers for a women-owner of a small ICT firm and the strategy of additional training for the access to ICT sector in Bulgaria, as two cases, which give examples for successful overcoming barriers before women in ICT domain. We use a mixed-method approach. The cases of women with regard to obtaining additional qualification and for entrepreneurship in the ICT sector are analyzed on the basis of in-depth interviews. Beside the qualitative analysis, there is provided a comparative analysis based on quantitative data, with the aim to examine gender differences in the readiness for additional training among employees in the ICT sector in European countries. The quantitative data are drawn from the latest wave (2021) of the International Social Survey Program (ISSP), dedicated to social inequalities.

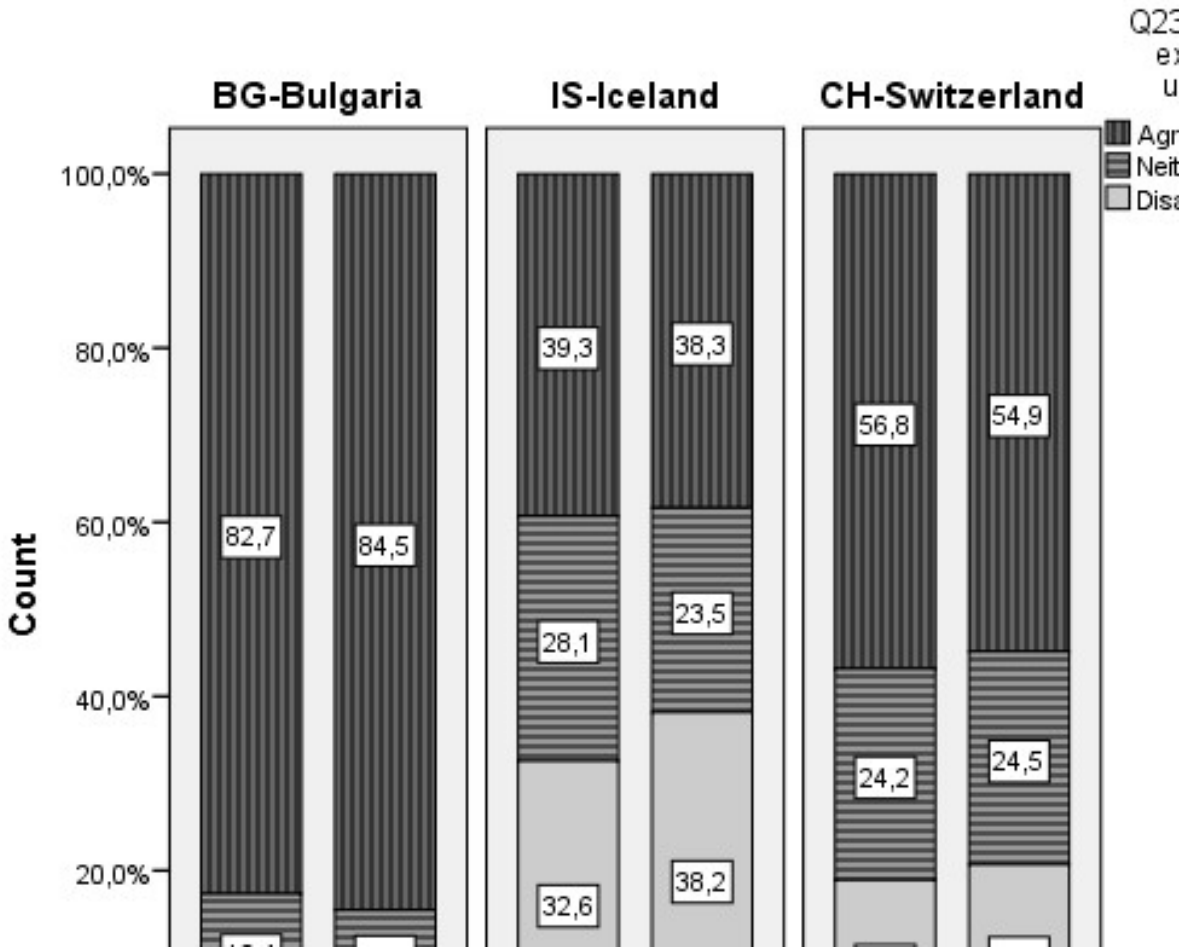
Attitudes to additional training

Using comparative individual data drawn from ISSP 2021, we focus on additional training and qualifications as an important component of the work situation in the ICT sector, and for all societies in the course of the accelerated digital transformation. The international comparison is between responses to the question about additional qualification includes Bulgaria, Iceland, and Switzerland. The statement "Workers would not bother to get skills and qualifications unless they were paid extra for having them" is supported by over 80% of Bulgarian respondents and by just under 40% of Icelandic ones; between the two countries is Switzerland, with just over 50% of the respondents who agree with this statement. The differences in the answers by gender are insignificant (Graph 1).

When we analyze the data only for respondents in the ICT sector, we find that the percentages of those who agree with additional qualification only when it comes with additional remuneration decrease even further in Iceland to 20%, while in Bulgaria and Switzerland the decrease is not so large compared with the answers of the whole sample (Graph 2). In Switzerland, however, the gap between men and women in the IT sector is the largest - 48% of men and only 37% of women in the IT sector would consent to undergo additional qualification only if this leads to higher incomes. The greatest support for additional qualification only when it comes with extra pay is by people in the age group 25-30 years, followed by people over 50, with the youngest and those in the middle of their career being less likely to agree with this statement - about 52% of respondents.

Graph 1 Responses to the statement, "I would not get additional training if it does not lead to better pay"

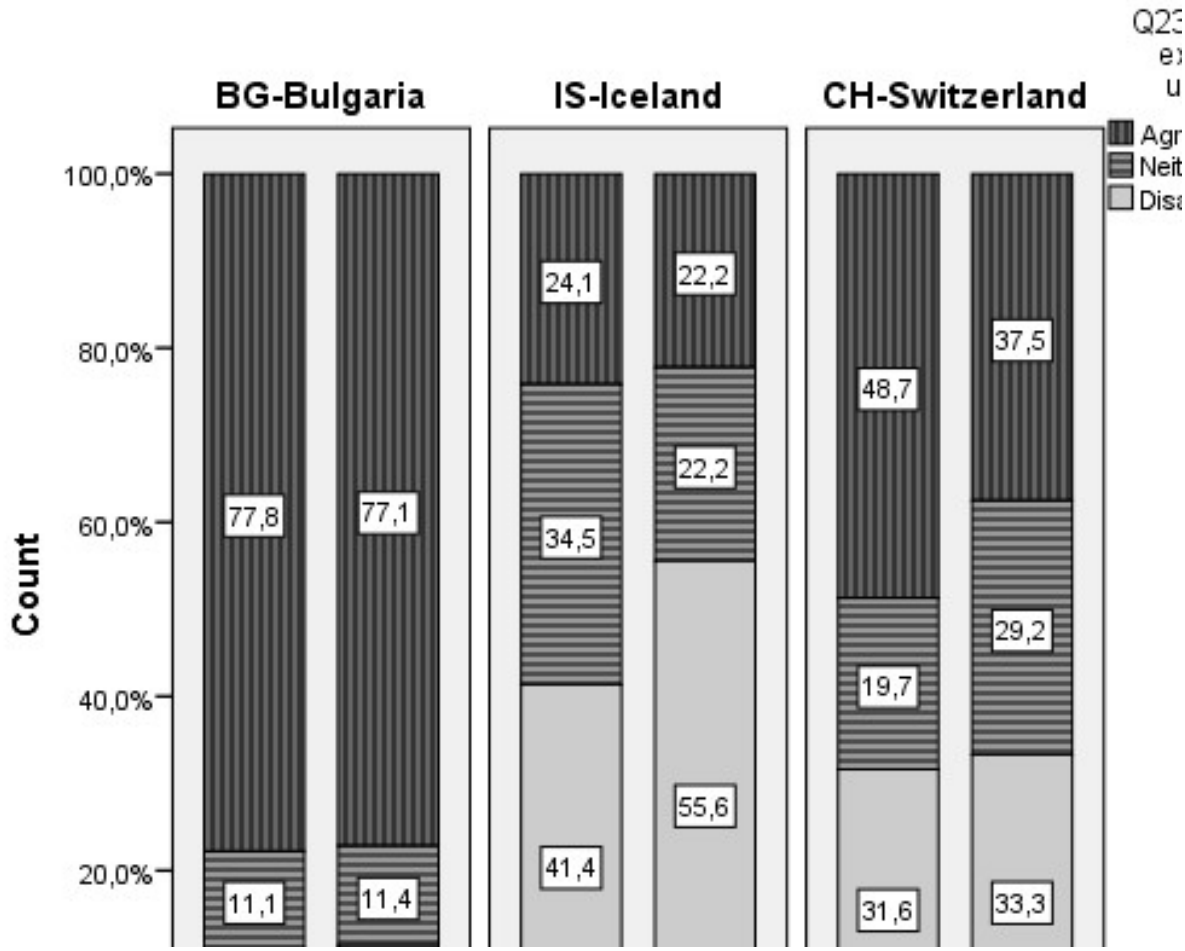
(within the whole population)



Source: ISSP 2021 , statistical analysis Kaloyan Haralampiev.

Graph 2 Responses to the statement, "I would not get extra training if it does not lead to better pay"

(among those occupied in the IT sector)



Source: ISSP 2021, statistical analys Kaloyan Haralampiev.

The data on the influence of COVID-19 on the labor situation of the people in the Bulgarian sample and in the IT sector do not differ significantly. Over 90% of the respondents state that the labor situation for them has not changed significantly in terms of their employment status. However, the reduction in income is a fact for those working in the IT sector. Women indicate getting 28% lower income during the COVID-19 pandemic, compared with 22% of men.

Additional training as a strategy for entering the IT sector

The case of Olga

Olga is the leader of a quality assurance team. This is one of the two leadership positions in a company that consists of 12 employees and is a daughter company of a large foreign company. She is 35 years old and jokes about being the oldest person in the company. The employees are mostly young, 21-years old. According to her, the oldest people in the IT sector are about 45-46 years; that is the maximum age. She sees the reason for the absence of older people in the fact that quality assurance is a new profession and there is little chance that people will have practiced it for a long time, as ten years ago, it was not a separate profession. But she goes on to say that such an explanation does not apply for the profession of developers, and yet none among them is older than 50 years.

Requalification, in her view, is a working strategy for entering the IT sector. Olga has a master's degree in Cellular Biology and Pathology. She took advantage of her motherhood leave to enter a two years course for developers in a private software academy, the reason for this being that she saw no perspective in Bulgaria for her initially chosen profession.

"*If I had remained working as a biologist, I would have had no development. I was writing a doctoral dissertation, I had to go back and defend it. After the doctoral studies, your only choice is a post-doctoral somewhere and… somewhere is usually not in Bulgaria, because here the possibilities are considerably less and the pay for post-doc programs is considerably less.*

In this case maternity didn't have a negative impact in Olga's career. During her maternity leave, Olga started attending a course for programmers, where she studied the programming language JAVA, and after the end of the leave she completed a two-year training course. She was then offered a job in quality assurance (QA). In the five years after finishing the course, she has worked for the company, she consecutively passed through the positions of junior, middle level, and senior specialist, and reached the position of unit leader for quality assurance of programming products. In three years, she became a senior, which was comparatively fast in her opinion. She is convinced that the work offers her "good chances and possibilities".

From additional interviews in the bank sector we know that maternity leave slows down the career growth of women. After returning to work, their salaries are not updated, which is a very negative factor in the post-COVID situation and the high inflation that ensued after the start of the war in Ukraine. Technological changes raise high challenges for women after interruption of work during maternity leave, and there is a risk the employers' support will not reach mothers with small children. In this situation Olga's suggestion is:

"Women should compensate in the course of work. Nobody will send you to get training when you return from maternity leave, because the bosses want to see whether you will get quickly back in pace and how often the child will be sick ..." According to Olga, "*to train and develop is an inevitable process. You must train constantly. This is at least half your work process*."She has personally taken part in extra trainings funded by the company and has received additional overtime bonuses.

Home office is the new reality after the COVID pandemic, and inasmuch as people employed in the IT sphere are mostly young women, the teams understand the need for more

work from home and of combining work for the company with care for the child and the family.“*Before the pandemic, home office was an exception. The normal thing was to go to the office. Now going to the office is the exception*.”

Despite the cooperation that colleagues offer and the support of the managers, women in the IT sphere encounter difficulties connected with prejudices regarding their aptitudes as programmers:

“*They usually don’t perceive you as a person with enough authority; they think you are not capable in technology because women, according to men, are stupider. There is discrimination in this aspect. There is also discrimination in the process of hiring people, especially women with little children… When I conducted hiring interviews and consulted my team about whom they liked more, whom I should hire, I also heard comments: ‘Hire the man, he won’t take maternity leave.’ But I think we should hire the more qualified one, no matter that he will take maternity leave. So women are still considered not that qualified.”* Women are assigned the easier tasks for longer periods of time due to lack of trust they will cope. *“There is a rather long process in which you have to prove yourself, and it is longer when you’re a woman*.”

On the other hand, women managers have certain advantages, which they use to change the leadership style in the organization. Olga strives to establish closer relations with her colleagues, better communication between leaders and newly-hired staff, young employees; she feels such relations are important for how the work is run.

“*We keep relations in the company more open, we strive to share more information with one another, because that was something that I have always felt the lack of – both in the IT sphere and in biology. Communication between the lead levels and the juniorlevelsis usually a bit lame.*

The junior person doesn't know where he is working, why he is working, how long he'll be there. In many cases, I don't know either, but we try to maintain the communication open."

The conclusion from the interview with Olga is that women encounter specific difficulties while caring for little children. But they can overcome them with additional training and support by the managers. Women also enjoy advantages if they are able to study and continue to develop professionally during the maternity period.

Women's entrepreneurship – barriers and advantages

The case of Dany

Dany, 36-years old, is a female owner of an IT company. She has the necessary *education*: she graduated a mathematics high school and after that graduated in informatics (with a major in programming) at a university in her native city. At the university, she chose programming as a specialty, not "teacher" because her mother and father are programmers. *"That is my heritage, I am continuing the line. My grandfather also applied for studying engineering in Germany*". Dany has experience both in programming and in work at the company founded by her father. After he withdrew from the business, Dany took over the company. She does not complain of lack of time, because the firm operates entirely for the local market.

"*In other companies, foreign ones, which work in time zones different from our time zone and the working hours are unusual, you might have to work at any time; this is not appropriate for a women*." The time zones for globally dispersed teams make such work inappropriate for women with small children, so, in Dany's opinion, the local companies have an advantage with regard to hiring women.

She does not feel any shortage of financial resources although her funds are not large. Here we may note what is said about companies owned by women, namely, that their striving to

enlarge their size is mostly limited to the range of what they have already achieved. Her company has 36 employees, of whom five are programmers; they are able to cope with the orders in pre-hospital assistance without having to draw bank loans.

An important factor of the company's successful functioning is the participation of the manager-owner in the professional association of software company owners working in the same sector as Dany. This professional organization was recently founded to protect the interests of small software companies (in the area of pre-hospital assistance) before the state institutions they work with. There are few women in the association, but they definitely do not feel there is any bad attitude towards them. The only important consideration in this respect is the company as such and how it has presented itself over the years. That is why the women-owners of software companies are not underestimated; *"I haven't sensed anything like a difference*".

As for social obstacles in terms of traditional role models and low public expectations from women in the sphere of programming and technologies, Dany felt such 20 years ago, in the university, when she heard one of her teachers say the following: "*Girls, we don't expect you to do great things, because this is a man's sphere*." And she concludes:

"*If a girl doesn't come from a family that backs her up, such an attitude on the part of the teachers automatically de-motivates you. Women who showed greater interest and were not isolated, but were not encouraged to try and see whether they might like programming, are at risk of losing interest. Because until you try doing something, there is no way you can know whether you are good at it. You don't always see whether the concrete job suits you and whether you can grow in it. And when there is motivation as well, and support, more women will want to give it a try in the sphere of programming. I know from my father that women should be*

tolerated, because women work very well, but they should also be told that they work well. They should be given a chance. Then they become very good at their work."

The specific task of the company's sector is to create software products and solutions in pre-hospital assistance; its products are most widely used by general practice doctors. The company holds one fifth of the market. It provides programming products for specialists, for laboratories, for dental surgeons and for occupational medicine. Each of these clients requires a separate product, which is designed for the particular case and requires maintenance; the company deals in sales and servicing. The latter activity proves to be a decisive gender-related reason for the company to hire, and work entirely with, women. A remote access maintenance unit has been created. Four young women work in the city, and they are looking for a fifth. Interviews are conducted for this, and the application of a woman programmer would have an advantage. The reason for this, according to the company owner is that : "*software maintenance is not the typical hardware or technician maintenance but involves explaining how the product works. We offer assistance to the doctor by explaining to him/her how to work with the program, we respond to questions that the doctor or the medical nurse has, what they should do with the product, and this is generally not the kind of work that a man would prefer".*

But Dany clarifies an additional reason why women are chosen: *"With us, the salaries are not competitive compared with the salaries in Western companies. The price of the programing products in pre-hospital assistance is low, and the work is very dynamic. This is imposed by the state institutions in this branch and the accelerated introduction of electronic healthcare services. So there is a lot of work in comparison with the received remuneration."*

Thus, the coin proves to have two sides: woman-programmers work in the company, the owner shows understanding about the working hours, they work only for the local market and

they don't have to work after the end of the working hours of the childcare establishments. But …the pay is lower than the average salaries of programmers, especially in companies that work for foreign markets. So the conclusion is that the medal has two sides – more women in the firm give better opportunities for WLB but the wages are lower compared with the programmers working for other firms as developers. The company hires some developers in retirement age: the oldest is aged 74. She also copes well with her work, although she is a little slower than the others, and would prefer to work from home. This is not a problem for the owner, who knows this employee well, trusts her, and can control her daily work from the office, through the company's network. Thus, the companies owned by women contribute to ensuring higher level of diversity and the inclusion of older employees.

We drew the same conclusion, regarding the greater potential for hiring older employees and regarding work in a diverse team, from the group discussion with people working in the public sphere who are part of a team headed by a woman. The chief accountant of the company, who is a woman retiree from the banking sector, has acquired experience in the last ten years of continuous entry of digital technologies in the finance sector. She is not afraid or unwilling to learn about new products and programs implemented for greater safety in the financial sphere, and continue to work successfully after reaching retirement age. When she has difficulties, she is not embarrassed to consult her younger colleagues. Diversity is a value that is well applied in teams headed by women. This enables the participation of a wider circle of potential employees, including people in retirement age, who have the desire to continue working and learning. Exchange of knowledge between generations is also ensured this team, as well as financial resources for new technological programs, training and support. Shortage of financial resources

for the technological change is a serious obstacle for the process of digitalization in the public sphere as a whole in Bulgaria, where women and employee over 50 prevail.

Conclusion

In this paper, we sought the answers to several research questions. What are the mechanisms that lead to underrepresentation of women in the ICT sector at macro and micro level? The analysis of the quantitative data and the interviews confirmed the conclusion that differences between men and women are preserved with regard to the benefits of digitalization, which remain unequal as regards the chances of obtaining work as developer in a private firm. The results confirm that the existing gender differences are due to social mechanisms connected with gender-specific work and jobs that require the use of digital technologies (Robinsonetal. 2015). The explanation that women primarily chose to work in the sphere of services for clients corresponds to one of the causes indicated in literature (Orser et al. 2020).The same is true as regards the lower expectations for good results and the avoidance of financial risks involved in drawing loans and expanding the activity. The present analysis shows that the company headed by a woman, in which women programmers are preferred as employees, offers lower pay, which women are willing to accept, while men would more probably look for better-paid work as programmers. This option is possible for men due to the peculiar market conjuncture for this profession. Combining work and family is a mechanism that also restricts the possibilities for women with children to get better pay as developers. The greater decrease of women's income than men's in the IT sector in Bulgaria during COVID is probably also a result of unequal gender distribution of commitments to childcare and the family, of work under the COVID pandemic restrictions and the growing importance of work from home.

Discrimination, the taste-for-discrimination model (Becker1957) is a significant negative mechanism for selection of women in ICT. The existence of discrimination against women in Bulgaria registered in previous analyses (Bertogg et al 2020) was confirmed through the interviews. Discrimination is evident in the preference for hiring young women without children for work in IT companies. The lower expectations teachers from young women in STEM specialties de-motivate some of them to seek higher achievements.

However, one of the social mechanisms with a restrictive effect on women, according to Ahuja's (Ahuja 2002) model, i.e., the insufficiency of informal networks and connections, is indicated in a positive aspect by the owner of the IT company in Bulgaria, who talked about the newly created association of companies in the sector of pre-hospital medical care, and the respect expressed for all members of the association regardless of gender.

Women in managerial positions change the style of management, improve communication between employees and make the structure more horizontal; thus, collaboration lends force to each employee of the organization. This conclusion is in line with the basic feminist thesis regarding the need for respecting differences between men and women and using those differences so that both genders can contribute what us unique to each: "It would be a thousand pities if women wrote like men,or lived like men, or looked like men,for if two sexes are quite inadequate,considering the vastness and variety of the world, how should we manage with one only?Ought not education to bring out and fortify the differences rather than the similarities?" (Virginia Woolf, quoted in Steinmetz 2012)

With regard to the question, "Is it possible to change one's initial formal education and upgrade it to ICT occupations?", Olga gives a very informative answer: it was possible for her to change her specialty and to develop programming skills to a sufficiently high level even during

her maternity leave. In her case, however, we should note that this positive example is of a woman with high human capital: she received a university education in the natural sciences and was strongly motivated to continue learning. Hence, all initiatives to motivate girls to choose STEM disciplines early in their educational career are beneficial for their future in the fast technological transformation of the societies.

The interviews also give an interesting answer to the question "What are the benefits of women's entrepreneurship in the ICT domain?" Women face obstacles in that sector, which contribute to their limited presence there, but their inclusion in ICT has its advantages. They change the style of leadership in the organization, stimulate communication between different management levels and work for diversity of the teams. Women on manager positions rely on sharing and cooperation between employees from different generations. That is why the participation of women in the sector should be stimulated; the recommendations should be addressed in several directions: to the government, to universities and high schools, and to companies and employer's organizations.

Policies for more women in the ICT sector

This study is in line with the EU's vision regarding the need to implement targeted gender-equality policies, as reflected in the Gender Equality Strategy 2020–2025. The Strategy focuses on various goals of gender equality which have the capacity to decrease the gender pay gap. Of these, this paper contributes to the goal of increasing the training participation of women in science, technologies, engineering and mathematics (STEM). The research focus on Bulgaria, where the share of women in the field of STEM is the highest level among all EU countries, points to the positive strategies but also to the alarming tendency of decrease in the number of

girls in STEM disciplines, a problem that requires deeper further study. The decisions taken at EU level are important for the trends related to gender equality in the member states, in spite of the resistance against, and abuse of the concept of gender in Bulgaria.

National governments should take measures to increase the number of women working in the digital professions. There are different measures and national governments should decide to create funds to develop the next generation of talent and help women enter the field of IT technologies, to support their return to work and for additional qualification, to stimulate female entrepreneurship.

At the levels of universities, schools and teachers the focus should be on the training of teachers , they should talk to students about the professions of the future, including a strong focus on STEM topics in schools. People need to know that in the future many of the things we do will be dependent on digital technology.

Regarding organizations, the recommendation is to provide role models, to support young mothers by ensuring more flexible conditions to make them feel comfortable. Support should be provided to older employees. "*As we move through different career stages, flexibility at work is particularly beneficial* " (Danny Michaud, who is leader of KPMG's EMEA cyber security practice)[7].

In order to increase the number of women working in cyberspace, professional profiles should be advertised for work in the field of security, going beyond the purely technical aspects and emphasizing the social aspects of security. *"I have always been interested in team dynamics and how people behave, so I chose cybersecurity in order to help clients build better security teams and some basic security processes. Women can successfully accomplish exciting tasks,*

[7] https://www.capital.bg

even if they don't like hardcore technologies." (Olga Kulikova, senior manager of Digital Transformation and Cyber security at KPMG – the Netherlands)[8].

The present article has its limitations and implies further research on the question, "To what extent does the teaching of mathematics and natural sciences contribute to the social mobility of children from families with a lower socio-economic status?" The systematic and constant study of this question would contribute to avoiding the loss of talents, the recognition of talents and their development from an early age. This concerns girls and boys equally, who should be guided and motivated to study STEM disciplines from an early age.

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