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Exploring the best practices of NGOs in IT-related empowering solutions for women and girls: The case of Armenia and Poland**

Summary

The article aims to explore the best practices of NGOs in empowering women and girls through IT-related solutions and reveals the obstacles that women face in this career path, as well as discusses the importance of developing their digital skills and encouraging them to choose STEM and ICT professions as an essential way to address the gender inequality in the digital labor market. It focuses on analyzing this situation in two countries: Armenia and Poland, and examines activities of four NGOs (two from each country) aimed at developing women's digital skills and encouraging them to choose STEM and ICT-related professions. The article shows that: 1) Polish and Armenian women are reluctant to choose STEM and ICT professions and are passive in the STEM and ICT job market, facing similar obstacles, such as gender based stereotypes in their societies or lack of role models; 2) The ways NGOs take to overcome these obstacles and methods of attracting Polish and Armenian women to this sector include providing more role models, raising awareness about the benefits of this sector, and implementing more projects that support women careers in science, technology, engineering and mathematics.

Keywords: digital skills, women's empowerment, STEM, ICT, NGO, Armenia, Poland

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Introduction

According to a recent study conducted in 2020 for the European Parliament's Committee on Citizens' Rights and Constitutional Affairs, despite positive changes regarding the percentage of women holding jobs related to Science, Technology, Engineering and Mathematics (STEM) with annual increase of 2.9 % from 2013 to 2017 (Zacharia et al., 2020) there is still gender inequality gap in STEM-related fields and in the growing digital sector. In fact, women pursuing their careers in Information and Communication Technology (ICT) are still too few. Women's total share in the European labor market in this field is less than 2% (Zacharia et al., 2020).

Among the reasons discouraging women to choose STEM and ICT-related professions there is also observed sexism at the universities and in the workplace (Brown, 2021). Currently, another factor needs to be taken into consideration. The world was coping with the challenges of the COVID-19 pandemic and many organizations, companies and institutions had chosen the option of remote work (Chinchilla, 2020). Developing women's digital skills can serve as a tool for empowering them, as it offers opportunities for more equal participation in labor markets and may help them achieve their financial independence (Sorgner & Krieger-Boden, 2020).

Women in Armenia are actively involved in higher education, but their participation in the labor market is lower compared to men. They have low enrollment level in STEM and ICT fields (Asian Development Bank, 2019). There is a strong need to encourage them to pursue STEM education. Historically holding a leading position in the natural sciences and mathematics since Soviet times, Armenia is actively turning into tech hub in the South Caucasus (International Trade Administration, 2021). In Poland, similarly to Armenia, there are few women in the IT industry. The report published by Geek Girls Carrots (an organization which aims to attract Polish women to the tech industry) reveals that, on average, in an IT team at a Polish company, usually there are three women per ten men (Geek Girls Carrots Foundation, 2018).

Poland is becoming one of the most attractive job markets in Central Europe, housing huge tech talent pools and attracting global billion-dollar companies to open their branches in the country (iXceed, 2021).

The main aims of the article are as follows:

1. Exploring the best practices of NGOs in IT-related empowering solutions for women and girls.
2. Discussing the importance of empowering women by developing their digital skills and motivating them to choose professions in the STEM and ICT fields. This is essential for addressing the gender inequality in the digital labor market.

3. Identifying the key problems and challenges preventing women from entering the STEM and ICT sectors, as reported by female insiders and the representatives of the NGOs in IT.

The article explores the following areas: (a) the concept of empowering women by developing their digital skills and attracting them to STEM and ICT field (Central-Eastern European perspective), and (b) the similarities or differences of situation in Armenia and Poland in the context of women's participation in the STEM and ICT labor market. It also examines the practices of the selected NGOs from both countries that aim to empower women by developing their digital skills and attracting them to the STEM and ICT fields.

Armenia is a small country located in the South Caucasus with the population of over 3 million, while Poland is in the Central-Eastern Europe and has a population of over 38 million. The latter is a part of the European Union, while Armenia is a member of Eurasian Economic Union. However, both Armenia and Poland used to be under the communist influence. After the collapse of the Soviet Union (to which Armenia belonged) both countries entered the transformation path.

Armenia and Poland were chosen for the study, because both countries still have a low representation of women in the STEM and ICT sectors. The digital labor market is male-dominated in both countries and there is a strong need to motivate Armenian and Polish women to pursue a career path in the STEM and ICT fields. Furthermore, in Armenia, as well as in Poland, the STEM and ICT sectors are developing rapidly, which means that each of the two countries has a potential of becoming a tech hub (as the statistics mentioned above revealed) – Poland in Central-Eastern Europe and Armenia in the South Caucasus. It is therefore important to empower women by developing their digital skills and encouraging them to choose careers in ICT and STEM, as these professions are becoming increasingly competitive in the global labor market. The STEM and ICT jobs are well-paid and flexible, which can help women gain greater financial independence and stability, becoming crucial to improving the gender inequality existing in these sectors. For this reason, there is a strong need not to focus on developing women's digital skills, motivating them not only to pursue a career in these fields but also create systems that will enable them to stay and become prosperous in these professions.

The presented research is predominantly qualitative and exploratory in nature. It utilizes desk research and data analysis of previous qualitative and quantitative research in the field. The use of a qualitative approach is relevant for this research, as complementary to previous statistical data collected and analyzed through observation and reviews of reports, scholarly and academic studies, articles, and databases that refer to the fact that there are not many women in the STEM and ICT-related job market in Central and Eastern Europe. National and international

reports were analyzed to have a clear idea about the situation in Armenia and Poland in the context of women's involvement in the STEM and ICT-related job market. Thus, a review of the above mentioned documents was applied to address the research problem that provided evidence of the limited number of women in the global STEM and ICT labor market. The question was: what do we do about it and who is responding to this gap.

In order to explore the practices of NGOs in Armenia and Poland, the case study method was chosen, as it is relevant to present the realities in both countries. Interviewing was selected as the data collection instrument to closely observe the activities of the selected NGOs and to find out details of their work. Four in-depth interviews were conducted in 2021 and 2022 with the representatives of four NGOs (two from Armenia and two from Poland). A set of 20 interview questions was used to delve deeper into the activities and projects carried out by them and by other NGOs in the two countries aiming to empower women through developing their digital skills and encouraging them to pursue careers in the STEM and ICT-related fields. The main topics discussed during the interviews were the following: women's encouragement methods to choose STEM and ICT-related professions, developing women's digital skills as a tool to empowering them, and the role of NGOs to achieve empowerment goals.

Four women from Armenia and four women from Poland currently employed in the STEM and ICT sectors were also interviewed to get a clear picture of the situation in both countries in terms of women's participation in the STEM and ICT labor market. The questions covered the following topics: challenges they face in their career path, their opinions about the role of NGOs in empowering and motivating women to choose the STEM and ICT careers and to develop their digital skills, and the reasons why there are only few women in the sector, Because of the COVID-19 restrictions, the contact with the NGOs and women from both countries was through online communication channels, e-mail, and Zoom communicator. An in-depth interview was chosen to investigate the research question concerning the practices of NGOs in Armenia and Poland. Engaging NGO representatives in deep conversations on their role and effectiveness in empowering women gave more clear understanding on their roles in encouragement given to women to pursue careers in ICT- and STEM-related fields.

Theoretical background

The word *empowerment* first appeared in academic literature in the context of civil rights. "Toward Black Political Empowerment – Can the System Be Transformed" is among the first articles, which were written in 1975 by John Conyers.

Later on, the term became widely used in the literature, when referring to empowering marginalized people, like women, the poor, and penetrated into different fields (Lausch, 2022). The definitions of empowerment are different taking into account various disciplinary traditions and spheres. However, most of the definitions are focused on acquiring power and control of making decisions that can affect the person's quality of life (Akter et al., 2017). Furthermore, this term has been adopted by international organizations and world business aiming at creating links with specific societal actors, for instance, women or specific group of marginalized people (CARISMAND, 2017). Naila Kabeer (1999) refers to it as a power to make a choice. That is to say, being disempowered means to be denied choice, so empowerment leads to change (Huis et al., 2017).

The term *women's empowerment* appeared in the literature in the 1980s and 1990s. The radical approach was based on the idea of changing power relations in favor of women's rights and promoting gender equality between men and women (Cornwall, 2016). Feminist scholars have a significant contribution to moving women's empowerment concerns into the gender and development agenda (Sen & Grown, 1987). They started discussing the unequal power relations which become an obstacle for women to take part in and have an impact on the development processes that can help to promote women's capacity at two levels: individual and collective. The focus was on the following: women's subjectivity as a key factor for change, the importance of resources (like, material or human) to women's capacity, to have control over the essential aspects of their lives, and the need for women to form a collective union and struggle against injustices they deal with together (Kabeer, 2017).

During the last century different *adult learning theories* were developed, but no single theory can be applied to the studied topic. However, each of them focused on specific aspects of adult learning (TEAL, 2011). Andragogy (developed by Knowles in 1968), which refers to the art and science of teaching adult learners, is based on six main principles: previous experience of the adult learner, willingness to learn, motivations of adult learners, their need to know, orientation to learning, as well as self-concept of adult learners. In summary, it is suitable for those who are goal-oriented and have motivation to learn (Knowles et al., 2015). Transformative learning theory (developed by Mezirow in 1978) notes that learners apply different assumptions, as well as expectations to understand the world around them. According to Mezirow's theory, adult learning process is not only about acquiring knowledge, as the word suggests, but it transforms action and in turn transforms the community where the learning process occurs (Calleja, 2014). Self-directed learning theory (developed by Garrison in 1997) highlights external control, as well as management of the learning tasks. It is a concept which refers to

learners' willingness and motivation of having self-monitoring and self-management when it comes to constructing and confirming outcomes of the learning process (Abd-El-Fattah, 2010) Experiential learning (developed by Kolb in the 1970s) focuses on the following four elements: learners' active participation, reflective observation, conceptualizing their experience and finally, putting into practice the knowledge which they gain from experience (Colman, 2019).

When it comes to women's empowerment in the context of developing women's digital skills, early feminist responses were mainly optimistic about the potential of digital technologies to empower women and improve gender relations (Wajcman et al., 2020). Furthermore, the International Telecommunication Union's study also states encouraging females to choose STEM professions and developing their digital skills are essential steps to address the gender inequality existing in these fields and empower women by making them more competitive in the job market (International Telecommunication Union, 2019). The report on promoting gender equality in STEM education and careers stresses that it is necessary to promote policies which will contribute to the participation of women in STEM field and address the gender gap across all levels of education and employment in the digital sector (European Parliament, 2021).

European perspective on the importance of developing women's digital skills

Women are underrepresented in the STEM and ICT fields in Europe

It is worth referring to the latest statistical information regarding women's participation in the STEM and ICT fields in Europe. In the European Union only 17 percent of ICT specialists are females (European Commission, 2019). According to the European Commission's 2020 Women in Digital Scoreboard, if compared with men, women in Europe are less likely to possess specialist digital skills. Women from the following countries show more activity in digital economy: Sweden, the Netherlands, Denmark, Finland, while women from such countries as Bulgaria, Greece, Romania and Italy have more passive participation both through the employment and use of internet or digital skills (European Commission, 2020). Eurostat provides the following statistics: about 41 percent of all the engineers and scientists (aged 25–64) in the European Union are women (about 6.3 million). Those European women who work as engineers and scientists are still largely underrepresented in the sector of manufacturing, only 21 percent, while they have higher representation in the jobs related to services sector, which is about 46 percent (Lago, 2021).

Developing women's digital skills as a way of empowering women

Today digital skills, as well as STEM qualifications are considered to enjoy a high demand on the labor market in Europe and globally. According to the research conducted by the Telecommunication Union (which is a UN organization), job opportunities in STEM field are expected to grow more intensively, and in order to improve the gender inequality in this industry, the first step is encouraging the education of young females in STEM from an early age and focusing on teaching digital literacy to women (International Telecommunication Union, 2019). Furthermore, the same source refers to the need of creating systems and cultures which can assist women not only to enter, but also to stay and thrive in these sectors. According to the UNESCO's report *Empowering rural women and girls through digital skills*, developing women's digital competences, and encouraging their education in STEM fields can foster their social, economic and political empowerment as well as improve gender equality (UNESCO, 2018).

European Union's initiatives

In the frame of the European Union's program Horizon Europe, research organizations which want to gain funding, are obliged to possess an actionable Gender Equality Plan. Furthermore, having gender equality in research and innovation is a vital component of the EU's Gender Equality Strategy for 2020–2025, which focuses on having gender equality in all the policies of the European Union (EEAS, 2022). The Commission's Women in Digital strategy focuses on encouraging and empowering women to play a more active role in the digital age. Women's involvement and active participation is indispensable for a sustainable, fair and equitable economy and society (European Commission, 2019).

Polish and Armenian challenges and programs to empower women in taking STEP and ICT sectors – case studies provided

The analysis of the situation in Armenia in the context of women's participation in the STEM and ICT sectors

After Armenia gained independence in 1991, about 900 ICT companies were established in Armenia (start-ups have 10% income tax) (Abramian, 2020). The ICT and STEM sectors in Armenia have experienced positive changes and significant growth during recent years. According to Darpass (2021), the ICT sector in Armenia has about 28,460 employees (16,212 of them work in IT companies) and about

1,800 students are graduates from different IT-related faculties of the Armenian universities (the population of the country is less than 3 million and around 1 million people live in Yerevan) (Darpass, 2021). The same source mentions that women in ICT and telecom sector of Armenia constitute more than 30% (taking into account the 2018–2020 period). The statistical information provided by the World Economic Forum's Global Gap Report of 2021, stated that female STEM attainment in Armenia was 10.16%, while it was 22.50% for males (in the context of education and skills) (World Economic Forum, 2021). According to the data provided by International Labor Organization, the share of women working in ICT sector is 44%, and the gender pay gap is 12% (International Labour Organization, 2019). However, the percentage of women leaders and founders of tech companies is low – 20% in Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine collectively (Sprague & Cape, 2021). The study conducted by the World Bank reveals that the stereotypes concerning the types of work Armenian women can do, their domestic duties and family responsibilities are an essential barrier to equality (World Bank, 2017).

Interviews with women working in the STEM and ICT industry of Armenia

In order to refer to the current situation in Armenia, four women working in this industry in Armenia were interviewed as a part of the research project. Random letters of the English alphabet are used to refer to the interviewed women in this research work, as they did not want their real names and surnames to be revealed.

- Participant A works as a senior software engineer at an IT company in Yerevan. She has worked in this field for nine years. She studied International Economic Relations for her Bachelor's degree and Computer Science for her Master's degree at the American University of Armenia.
- Participant B is a scientist. She got her Bachelor's degree in Physics and her Master's degree in Astronomy from the State University of Armenia. She has worked in the field of science since 2013.
- Participant C works as a regulatory data researcher at a Fintech company in Yerevan. She has worked in this field for more than five years. She got her Bachelor's degree in Oriental Studies from the State University of Armenia and a Master's degree in Political Studies at the University of Jordan.
- Participant D works as a product designer at an IT company in Yerevan. She studied Applied Mathematics at the State University of Armenia and specialized in Information Security. She has worked in this field for more than 4 years.

When asked about the gender balance at their companies, participant A, participant C, and participant D mentioned that the majority of the employees having

STEM and ICT-related job positions are men. Participant B said that there are more females than males at her workplace. Participants A, B, C, and D noted that they did not face any serious obstacles in their professional life based on their gender. The interviewed women referred to the following barriers that Armenian girls and women face in their STEM and ICT career path:

- Participant A thinks that responsibilities Armenian women have in family life is one of the main barriers. Some of them do not manage to graduate from university and get a degree because they get married, have kids and do not have time to complete their studies.
- Participant B notes that women's education in Armenia was not considered to be important for years, only their role in the family was viewed as essential. However, she thinks this situation is changing in Armenia, as now more women combine work and family life effectively.
- Participant C and participant D said that gender-based stereotypes were also noted by the interviewed women as a serious obstacle.
- When the interviewed women were asked to express their opinions about the ways of encouraging females in Armenia to choose STEM and ICT-related professions, they discussed the methods, which are mentioned below:
- Participant A pointed out that studying at STEM faculties of the Universities is often described "very hard" in an exaggerated way. It is necessary to make some campaigns for young females in Armenia which are focused on presenting STEM fields in a positive way, stressing that these jobs are well-paid and flexible.
- Participant B stressed that it is vital to raise girls in their families to be independent when it comes to decision making since early childhood. Parents should only support their children's choice of the future profession and avoid forcing them to select the career path which they prefer.
- Participant C was of the opinion that organizing special sessions or training courses for young females in Armenia at schools, NGOs or other organizations to raise their awareness about this sector and teach them digital, STEM and ICT-related skills.
- Participant D referred to the need of reforming the programs and improving the environment at the STEM faculties of the Armenian Universities.
- Participants A, B C, D, noted that the number of women working in the STEM and ICT sector became higher during recent years. Participant A pointed out that currently there are also many internship programs at different IT companies in Armenia which are suitable for fresh graduates as well. "About 10 years ago, such opportunities didn't exist and it was harder for a woman to find a job at IT companies", as participant A notes, while participant D thought women

are more detail-oriented than men and they have the potential to achieve more success in these sectors. When asked about the role of NGOs in Armenia to empower girls and women with IT solutions and encouraging them to select STEM and ICT professions, participant A, B, C, D mentioned that they did not participate in any projects organized by NGOs, participant B and participant C believed in the effectiveness of such initiatives, while participant D had no opinion and participant A did not believe in the effectiveness of such initiatives organized by NGOs.

Interviews with NGOs focused on empowering women through developing their digital skills and encouraging them to select STEM and ICT professions in Armenia

To explore the situation in Armenia in terms of women's participation in STEM and ICT industry, the activities of the selected NGOs focused on empowering women through developing their digital skills and encouraging them to choose STEM and ICT-related professions in Armenia, interviews were conducted with representatives of two NGOs from Armenia, namely: Girls in Tech Armenia and Women and Information Society. Girls in Tech Armenia works towards "3 Es – engage, educate and empower women with technology". The NGO aims to engage girls and women from different fields, educate (it is more about non-formal education) and empower them, and the latter is one of the key pillars of what they do, as the representative of the NGO mentions. The Women and Information Society NGO promotes women's integration to information society in Armenia and women's empowerment with technologies, as well as fosters their technological education, entrepreneurship in IT, encourages their participation and leadership growth in ICT and its related fields. The main target groups of both NGOs are girls and women, there are no age restrictions in case of Girls in Tech NGO, while the main project (Technovation Girls) which implements Women and Information Society is for girls who are between 8 and 18 years old. The representatives of both NGOs mention that all of their projects are based on women's empowerment and defined "women's empowerment" in the following way:

- The representative of Girls in Tech NGO notes "being and setting an example is the way we practice empowerment."
- The representative of Women and Information Society NGO mentions that women's empowerment is practiced through education, "giving young women and girls tools, education, which has to be in line with the 21st century so that they can implement this knowledge in their society and become strong change makers. Education is the key from our perspective."

- "It is vital for everyone to be digitally literate in today's digital era, and especially for women, as boosting women's digital skills means making them more powerful and self-confident to achieve success regardless of their career choice," notes the representative of Girls in Tech Armenia. The representative of Women and Information Society points out that digital skills are becoming an essential element of our daily and highlights the importance of focusing not only on Yerevan, which is the capital of Armenia, but also in the regions.

When the representative of Women and Information Society referred to the reasons that few women in Armenia have STEM and ICT-related jobs, the following was mentioned:

- Stereotypical thinking in Armenia (especially in the regions) that STEM and ICT jobs are not for females. It is a career path for men.
- Lack of information. There is a need to raise awareness in the regions of Armenia.
- The representative of Girls in Tech Armenia mentioned the following challenges that Armenian women face in the STEM and ICT labor market:
- Even if women have job positions in the STEM and ICT sectors, men have the job positions which are connected with leadership.
- Pay gap.

When referring to the reasons that STEM and ICT professions are not popular among young females in Armenia, the representative of Girls in Tech Armenia points out that in the frame of their projects, they met some girls who have good skills related to STEM, but when asked about their career choice, they mention humanities. These young girls make the decision regarding their career path taking into account their future job opportunities, especially in the regions of Armenia, while the representative of Women and Information Society thinks unlike regions of Armenia, IT field is becoming a popular career option for young girls who live in Yerevan, which is the capital of Armenia.

According to the representative of the NGO Girls in Tech , the sector is currently male-dominated in Armenia and she thinks women's participation in technology-related job positions can be 20–30%. The representative of Girls in Tech NGO notes that the local branches of international IT companies in Armenia need to implement diversity and inclusion policies and recruit more women, which fosters the involvement of more female employees in the sector, while the representative of Women and Information NGO stressed the need of having a collective action, that is to say, both government and NGOs should unite their efforts to improve gender equality in the STEM and ICT spheres.

Regarding NGOs' actions to foster the active participation of Armenian women in the STEM and ICT job market and encouraging young females to build their careers in this sector, the interviewed NGO representatives pointed out the following:

- Empowering girls and women to select the career path they prefer from STEM and ICT sector(or any other field), as well as helping them build their self-confidence by developing their digital skills, as the representative of Girls in Tech Armenia mentions.
- Sharing success stories of women who have significant achievement in the STEM and ICT field is an effective way of encouraging young girls in Armenia to select this career path (the representatives of Girls in Tech Armenia and Women and Information Society NGO expressed this opinion)
- Implementing sustainable and result-oriented projects which aim to educate girls with IT skills, having discussions, meeting, talks also in the regions of Armenia informing girls and women about the opportunities which this industry can offer, according to the representative of Women and Information Society NGO.

The analysis of the situation in Poland in the context of women's participation in the STEM and ICT sectors

The STEM and ICT sectors in Poland are highly male dominated, as the statistics reveal. According to the study conducted by No Fluff Jobs, which is a Polish information service related to IT positions – women make up about 30% of IT specialists in Poland. Furthermore, 22% of those who show active participation in the industry in Poland acquired their professional skills through self-study (Janecka et al., 2020). A 2020 study conducted by Perspektywy Education Foundation, "Kobiety w Technologiach" ("Women in Technology"), found that Polish women face sexism at technical universities as well as tech companies in Poland and some of the women mentioned gender-based unfavorable comments are very common at many companies (Perspektywy Education Foundation, 2020).

The ICT field in Poland is developing quite rapidly and it is becoming popular among students, because the industry offers the highest earnings in general. The data collected by Statista notes that the number of students engaged in ICT studies has increased during the academic year 2020/2021, about 66,000 people studied subjects related to this field (Sas, 2022). However, according to the Gender Equality Index 2020, 77% of ICT graduates are men, and only 23% are women, 86% of ICT specialists are men, while just 14% are women, also when it comes to basic digital skills, the percentage of men equipped with relevant digital skills is higher (European Institute of Gender Equality, 2020). When it comes to the STEM field, the recent study conducted in 2021 by Agnieszka Swigost-Kapocsi (2021) states that women are less likely to study, as well as work in this industry than men in Poland (Swigost-Kapocsi, 2021)

Interviews with women working in the STEM and ICT industry of Poland

In order to discuss the current situation in Poland in the context of females' participation in the STEM and ICT sector and refer to the challenges they face in their career path, as well as ways of encouraging girls and women to choose STEM and ICT-related professions, four women working in this industry in Poland were interviewed.

Random letters of the English alphabet are used to refer to the interviewed women in this research work, as they did not want their real names and surnames to be revealed.

- Participant E works as a Technical Product Manager at an IT company in Poland. She has worked in this sector for 16 years. She got her Bachelor's degree in Computer Science and Master's degree in Mathematics.
- Participant F is employed as a Principal Software QA Engineer at an IT company in Poland. She has about 14 years of work experience in this field. She has a Master's degree in Computer Science with a specialization in Computer networks and Database systems.
- Participant G works as a Test Automation Engineer in Poland. She studied Sociology at the university and later on participated in different trainings and courses related to her current occupation and in this way, she changed her profession. She has worked in this field for more than six years.
- Participant H worked as a Software Developer at an IT company. She got her Master's degree in Artificial Intelligence. She has about eight years of work experience.

When discussing the topic of gender balance at workplace, participants E, F, G, H responded that there are very few women in the team at the companies where they currently work and where they worked before. Participant E and participant F noted that women at their companies have job positions mainly related to product management, business analysis, graphic design. Participants E, F and G mentioned that they faced some obstacles in their professional life based on their gender, while participant H pointed out that she faced no such obstacles in her career.

When asked about the reasons why there are few women in the STEM and ICT fields in Poland, the following was mentioned:

- Participant E and participant G were of the opinion that the society in Poland is patriarchal and this gives birth to many gender-based stereotypes, for instance, humanities are for women, while science or engineering for men.
- Lack of role models who can inspire young females in Poland and show them the benefits of working in this industry, as the participant R mentioned.

- Participant H referred to sexism at universities and at workplace.
- The methods of encouraging young females in Poland to select STEM and ICT-related professions were also discussed during the interviews and here are the key encouragement ways that the interviewed women think can be effective.
- Participant E thinks that both parents and teachers should encourage young girls in Poland to explore and dig deeper STEM fields when they noticed that girls are interested, while the participant G adds that their role is vital in this case, but it is necessary, first of all, to educate parents and teachers.
- Participant G and participant E highlighted the importance of showing young girls role models, raising their awareness about successful women from STEM and ICT fields.
- Encouragement methods should be practiced starting from a very early age, at kindergartens, schools, as stated by participant F.
- Addressing sexism and creating friendly space for women, as stresses the participant G.

When asked about the role of NGOs in Poland that make efforts to empower girls and women with IT solutions and encouraging them to select STEM and ICT professions, participants E, F and H mentioned that they are actively participating in different projects organized by NGOs in Poland, while participant H never participated in such initiatives and she wasn't informed about any projects implemented by NGOs. Participant E, participant G and participant H mentioned that they believe in the effectiveness of such initiatives, while participant F didn't have a clear idea whether such programs are effective or not.

Interviews with NGOs focused on empowering women through developing their digital skills and encouraging them to select STEM and ICT professions in Poland

To study the situation in Poland in terms of women's participation in STEM and ICT industry, the activities of the selected NGOs focused on empowering women through developing their digital skills and encouraging them to choose STEM and ICT-related professions in Poland, the representatives of two NGOs from Poland were interviewed, namely: Women in Technology, and Women of Science Foundation. Women in Technology NGO is focused on IT and new technologies, it aims to help Polish women develop their IT-related competences, strengthen women in leadership positions and create a friendly space for them. The mission is to encourage women to join the IT world and provide them with necessary support so that they can help other women as well, while Women of Science Foundation supports the careers of Polish women scientists and promotes their achievements as scientists and researchers.

According to the representative of Women in Technology NGO, "empowering women is our strength to support each other. We are trying to build a strong female community", while the representative of Women of Science Foundation mentioned, "We want to show that it is possible to develop a network of Polish scientists that will inspire and facilitate the implementation of various projects. We are also concentrated on fighting stereotypes concerning the female status and role in the society." The representative of Women in Technology NGO pointed out that developing women's digital skills can help them build self-confidence and feel more comfortable in the digital world, as technology is now everywhere, while the representative of Women of Science Foundation was of the opinion that being a strong and independent woman means being up to date with technological innovations, as it is a chance to achieve success in an extremely competitive environment.

When asked about the reasons why few women have STEM and ICT-related jobs in Poland, the representative of Women of Science Foundation referred to two obstacles: (a) gender based stereotypes existing in Polish society that STEM and ICT sectors are for men, and (b) discriminatory attitudes towards women. The representative of Women in Technology NGO also noted that it is difficult to build self-confidence in a male dominated sector, when you constantly have to prove that you are not only a beautiful girl, but have relevant professional competences. The representative of Women in Technology NGO considered the stereotypes existing in Polish society and the lack of role models are the main reason that girls are reluctant to choose science, engineering or any other STEM subject and she thinks young girls have only teachers at school, or the lady working in the library, as role models. The representative of Women of Science Foundation was of the opinion that in Poland, the greatest gender imbalance can be observed in engineering and technology sciences, as well as natural sciences (though there is a relative balance in medicine and agricultural sciences), while female predominance is visible in social and human sciences.

The representative of Women in Technology NGO noted that the situation in terms of women's participation in STEM and ICT sectors in Poland has changed for the better in recent years, as more females are now employed in various IT companies than it was previously, however, they mainly work as project managers, product managers, graphic designers, etc. She added, "I think it will take more than five years to have equality in IT". The representative of Women of Science Foundation thought that the situation has not improved visibly, but it does not concern only Poland, as the situation is similar all over the world. She also refers to some organizations and successful campaigns in Poland, which make efforts to improve the situation, like programs Girls as Engineers/Girls go Science or Mentoring Program "Lean in STEM". When it comes to the anticipation regarding the

future of this sector in terms of gender equality after 5 years, she pointed out, "It is really hard to predict. I want to believe the situation of women will improve, in my personal circle I have men who work in the IT sector and they do very strongly advocate for more women in this field."

When it comes to NGOs' actions to foster the active participation of Polish women in the STEM and ICT job market and encouraging young females to build their careers in this sector, the representative of Women in Technology NGO thinks that it is necessary to collaborate and cooperate with other NGOs, which have the same mission and promote each other's projects, as working together can be more effective to reach and help more women. It is vital to have more projects for women, make efforts to struggle against the gender based stereotypes which create unfavorable conditions for Polish women to select STEM and ICT career path, and show them more role models, while the representative of Women of Science Foundation said, "Raise awareness of the problem, discuss the possible solutions, show examples of good practices, and influence local and central legislation members and authorities".

Research findings and recommendations

Findings based on interviews with women

The key findings revealed as a result of interviewing women employed in the STEM and ICT sectors in Poland and Armenia are mentioned below:

- Most of the interviewed women working in STEM and ICT fields both in Poland and Armenia have relevant educational background; only a few of them obtained their university degrees related to humanities and later on changed their professions.
- Most of the employees having STEM and ICT-related job positions at the companies where the interviewed women currently work are men (the situation was the same also at their previous workplaces).
- None of the interviewed Armenian women faced obstacles in their career based on their gender, only one of them mentioned a slight discomfort which she felt at the beginning of the integration process into the male-dominated team, while most of the Polish women referred to gender-related obstacles at workplace, like unpleasant comments about their professional competences and sexuality.
- Both Armenian and Polish women think that gender-based stereotypes existing in Poland and Armenia are among the main reasons why there are few women in the STEM and ICT sectors in both countries. The Armenian women

interviewed also consider responsibilities that they have in their families after getting married to be an essential barrier, while the Polish women referred to the lack of role models, sexism at universities and in the workplace.

- All the interviewed women highlighted positive changes which happened in the STEM and ICT job market (especially IT field) in the context of improving gender equality and women's participation both in Armenia and Poland.
- None of the interviewed women from Armenia participated in any projects implemented by Armenian NGOs aimed at empowering women by developing their digital skills and attracting them to STEM and ICT sector, while most of the interviewed women from Poland actively participated in various projects initiated by Polish NGOs related to the STEM and ICT fields.
- The majority of the interviewed women from both Poland and Armenia think the role of NGOs and their projects is vital in motivating women to select STEM and ICT career path.

Findings based on interviews with NGOs

It is worth referring to the following findings as an outcome of the interviews conducted with the representatives of the selected NGOs from Armenia and Poland:

1. The main goals, as well as projects implemented by the selected NGOs from Armenia and Poland were focused on empowering women by developing their digital skills and encouraging them to select STEM and ICT professions.
2. The definition of "women's empowerment" interpreted by the NGO representatives stresses the following:
   a) "Being and setting an example", focusing on role models as an encouragement method,
   b) "Education is the key", putting the knowledge into practice can help females become change makers in the society,
   c) "Supporting each other to build a strong female community",
   d) "Fighting stereotypes concerning the female status and role in the society and promoting gender equality in different areas of social life".
3. The challenges women face in the STEM and ICT labor markets include: the pay gap, the lack of female leadership positions and the constant need to prove they have the relevant skills and professional competences.
4. STEM and ICT professions are not popular among young females in Armenia and Poland. In case of Armenia there is a lack of information and a need to raise awareness about the benefits of STEM and ICT sectors, especially in the regions of Armenia, as the situation is changing in the country's capital. In both countries there are few female role models and there is a strong need to show

young girls more examples of successful women from STEM and ICT sectors to encourage them to pursue a career path in this industry.

5. Currently, the STEM and ICT sectors in Armenia and Poland are male-dominated, but in both countries the situation in terms of women's participation in the STEM and ICT sectors has changed for the better in recent years and most of the NGO representatives think the situation will become better in the future.

Discussion and conclusions

The comparative analysis between Armenia and Poland, two countries with distinct socio-economic backgrounds and histories, reveals shared obstacles for women and girls entering the STEM and ICT fields. Despite their differences, both countries face similar hurdles that limit the full participation of women in STEM and ICT professions. This aligns with research aim of identifying the main problems and challenges preventing women from entering the STEM and ICT sectors, as reported by the female respondents and the representatives of the NGOs. Societal norms, such as social disapproval and the perceived divide between "masculine" and "feminine" professions, alongside the persistent need for women to prove their competences in the workplace, resonate with global research and reports from international organizations. This illustrates that the challenges women face exist not only in Armenia and Poland but are a global phenomenon, as outlined in the initial chapter of this research. Furthermore, in line with the research aims, it is evident that NGOs play a crucial role in implementing empowering solutions to attract women and girls to the STEM and ICT sectors. The importance of developing digital skills and motivating women to pursue STEM and ICT careers is highlighted as essential for addressing gender inequality in the digital labor market. The research findings highlighted that the relevant level of digital literacy, as well as the employment opportunities in the STEM and ICT labor markets, can empower Polish and Armenian women by giving them an opportunity for professional growth and financial independence, as in both countries this industry is well-developed.

The identified problems and challenges, gained from insights provided by female informants and NGO representatives, form a basis for collective action, which involves a multi-stakeholder approach. NGOs, international organizations, governments, and the private sector are encouraged to unite efforts to enhance gender equality in the STEM and ICT job market. The implementation of collaborative initiatives can significantly contribute to empowering women by developing their digital skills, thereby fostering professional growth and financial independence. In essence, the interviewed women, NGO representatives, and researchers emphasize the necessity of a concerted effort to address gender inequality in STEM and ICT and not only creating an

environment that supports women in entering these fields but also enables them to thrive. The current study can be particularly useful for researchers interested in women empowerment and can serve as a valuable material for NGOs interested in this topic. It can become a subject to further research or study on issues related to women's empowerment within the context of STEM and ICT gender-related solutions.

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