Chapter 12
Best Practices and Lessons from Academia-Industry Collaboration Initiatives

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Bo, Industry Manager. Based on the resources in this chapter, Bo sees ways in which he can improve the support for female team leaders to enhance their careers and create greater gender equity in his department. He has a better understanding that the problems that he has been facing are common across industry, but that there are well-understood mechanisms for creating an inclusive work environment. He initiates a partnership with a local university to highlight the opportunities available to female undergraduates and create a talent pipeline for his company.

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B. Penzenstadler et al. (eds.), *Actions for Gender Balance in Informatics Across Europe*, https://doi.org/10.1007/978-3-031-78432-3_12

Nicole, Activist. The content of the chapter and the further reading that it suggests become a rich source of material for Nicole for her work creating flyers, brochures, and presentations for schools and companies. Based on some of the data discussed in the chapter and associated references, she initiates a targeted campaign for local elected representatives to raise their awareness of the potential benefits, both societal and economic, of getting more women involved in the IT industry.

12.1 Introduction

The importance of the IT industry in Europe is clear as the digital revolution now touches all aspects of our lives, a trend that was only accelerated by the pandemic. This revolution has the potential to bring huge benefits and prosperity, but also threatens to sharpen divides. One way to guard against sections of society being disenfranchised by the change is to ensure that inclusiveness and diversity are key elements of the revolution. However, it has long been recognised that the representation of women within the relevant industries is low, and those that do find themselves working in the sector often feel isolated and unsupported. For example, in a large scale study, 30% of women working in SET jobs in the private sector expressed feelings of isolation within their work environment [29]. In a study of 2008 based in the US Science, Engineering and Technology sector, 40% of women reported that they did not have role models, and nearly half, that they did not have a mentor [28]. As reported by Ashcraft et al. in 2016 [2], lack of support and informal networks has a profound impact on the sense of belonging for women in technical roles, leading to feelings of isolation. Moreover, the women identified the lack of mentorship or sponsorship as a key barrier to retention and advancement.

Sadly, although these problems have been highlighted for over a decade, progress has been slow and women are often faced with a difficult working environment even though it is now more important than ever that they are included in the workforce that is shaping the future of our society. In the paper "The Gender Digital Divide in Europe" [39], the authors discuss the impact of a digital divide across all aspects of women's lives. Urgent action is needed.

On the positive side, the European Commission has set out a five year strategy for gender equality, 2020–2025, which could have far reaching consequences if fully implemented [13]. A range of stakeholders are identified as having a responsibility to change the current situation, and the need for following through on previous proposals. For example, there was a proposal in 2012 relating to gender balance on boards and as non-executive members of company boards. But this was not made into a Directive. In the 2020 strategy, the Commission calls on the European Parliament and the Council of Europe to adopt the proposal for a Directive on this proposal and to adopt measures to improve gender balance at all levels of their own

management and leadership positions. The strategy also recognises that there must be a responsibility on member states to implement such a Directive, and to increase their own gender equality in decision-making positions.

In this chapter, we report on previous initiatives, programs, policies, and projects that have been developed in cooperation with industry. The benefits of these can be delivered across the whole pipeline, from encouraging girls in schools to take up the discipline, to career advancement for experienced female professionals. We also consider how governments can support the objectives to improve gender balance in the IT industry, through general initiatives for gender equality in society.

12.1.1 Goal of the Chapter

The goal of this chapter is to highlight some of the initiatives, programs, policies, and projects that create or advance gender balance in informatics across Europe. These include legislation like gender quotas. They also include creating networks, designing family-centered leave policies, and other strategic interventions implemented in the workplace that prioritize the needs of women.

To give greater visibility to such actions, we sought to investigate the landscape of initiatives, programs, policies, and projects in the EUGAIN and adjacent networks to gather examples from university, primary and secondary school, non-governmental organizations, industry, and government.

Specifically we conducted a survey to gather initiatives, programs, policies, and projects that increase gender balance in informatics and ICT fields. The team shared a Google Form through channels that we had access to through organizational connections and the EUGAIN network. They are: Informatics Europe, ACM womENcourage 2023, listservs, direct contact emails. Members of the community were asked to use the survey to share activities from their own context (university, company, region or country), its objectives, actions and outcomes.

12.1.2 Chapter Roadmap

The rest of this chapter presents the survey questions and demographic breakdown of responses. We then present the landscape of policies and best practices for recruiting, promoting, and retaining women in the informatics industry. These include the intersections of university-industry partnerships as well as legislation that impacts women. We then outline best practices for shaping the role of women in informatics in society. These include increased visibility and de-stigmatizing women in tech. Finally, we provide our own commentary and insights from the work we did to support this initiative. We also present ideal next steps for advancing gender balance in informatics.

12.2 Background

12.2.1 The Gender Gap

The gender gap, defined as disparities between men and women in areas such as economic participation, political empowerment, education, and health [24], remains a significant challenge in the informatics industry. Gender quotas, adopted by many countries to correct gender imbalance in legislative and professional domains, have been effective in increasing women's participation across various sectors [23]. However, these quotas alone cannot dismantle the deep-rooted cultural practices, values, and stereotypes that sustain gender discrimination, and serve to highlight the complexity of the issue [11].

Notably, women elected through quotas are often more qualified than the men they displace [4], which demonstrates the potential effectiveness of such measures in promoting capable leadership. However, the persistence of gendered practices continues to impede the full effectiveness of quotas in integrating women into legislative roles and overcoming the barriers posed by the glass ceiling [23].

The gender gap is particularly pronounced in the ICT sector [11, 32]. In the EU, only 16.7% of ICT students are women, reflecting a close relationship and strong association between masculinity and computing studies [36]. Socioeconomic variables such as unemployment, GDP per capita, and the Gender Equality Index do not significantly explain the scant presence of women in ICT fields [11], suggesting more intricate societal forces at play. However, the growth of GDP in the ICT sector has the greatest impact on increasing the number of employed women in ICT [32]. In corporate environments, the lack of female representation on boards underscores the broader issue of under-representation in senior management roles [9, 26].

Addressing these issues requires a multifaceted approach. University-industry partnerships can play a crucial role in bridging the gender gap by providing targeted education and career opportunities for women. Such partnerships can create pathways for women to enter and advance in the informatics field, leveraging academic and industry resources to support women's careers [14].

Research shows that greater alignment between organizational social consciousness and formal institutions, like gender quotas, advances gender representation on corporate boards in Europe. Policymakers are urged to go beyond mere codification of rules and work towards raising social consciousness on gender equality issues. This involves promoting awareness and education about gender biases and implementing policies that encourage inclusive practices.

To further support these initiatives, establishing forums that serve as platforms for dialogue among women stakeholders, including policymakers, can be highly effective. Working groups within these forums could develop policy papers on gender gaps in Science, Technology, Engineering, and Mathematics (STEM), analyzing current situations and providing recommendations for the future. These papers would be discussed in the forums and presented to authorities, with lobbying efforts to ensure the implementation of recommendations.

Additionally, creating educational workshops that introduce young girls to coding in a creative and engaging environment can help break down stereotypes and encourage more girls to consider careers in technology. An active example of this effort is the Creative Coding project [16]. These workshops can combine coding with elements of music and art, providing a unique and supportive community that fosters interest in STEM fields from an early age.

12.2.2 The Importance of an Inclusive Work Environment in IT

Historically, women have been underrepresented in scientific and technical fields and remain under-represented in technological professions in the labor market [20]. Although the proportion of the population with higher education is gender-balanced in the EU, women are less likely to be employed as scientists and engineers. Specifically, a 2021 study shows that women made up less than a quarter of freelance professionals in the fields of Science & Engineering (S&E) and ICT [20]. A 2006 report from the European Commission [31],[21] indicates low participation of women in the ICT sector, especially in decision-making roles. A similar study from 2023 reiterates this observation, showing that only 17% of ICT specialists in the EU are women [12].

Another area of the labor market where women are significantly under-represented is in entrepreneurial activities in technology-oriented fields. A study conducted in Canada [31] shows that the start-up culture is perceived as being dominated by men ("bro culture of alpha males"), which can discourage women from becoming entrepreneurs.

In [15] and [48] the importance of creating an inclusive work environment in IT is emphasized, especially to counter the obstacles women face. These obstacles include gender stereotypes, a lack of female role models, and a work environment perceived as hostile.

Beyond the EU's commitment to gender equality in all areas, the strategic importance of the technology industry to the EU's economy means that gender diversity within this industry is crucial to ensure full participation of women in society. As the EU economy shifts to increased digitalization, greater efforts are necessary to encourage women's participation in the digital economy. Creating an inclusive work environment in IT requires a conscious and sustained effort from companies. The hope of EUGAIN and other gender balance interventions is to contribute to creating a more equitable and conducive work environment for women, leading to a more diverse and innovative IT industry.

12.3 Related Work: Shaping the Landscape of Best Practices in Cooperation with Industry

12.3.1 Networks for Women

As women make their way into the tech field, a sense of community and belonging arises as a necessity for a functioning working environment. In this sense, the role of networks built to (and from) women is growing. Networking and mentoring are crucial for women's career progress, often leading to job offers, project collaborations, and industry conference invitations. In the tech industry, where women are often underrepresented, these connections offer a platform to share experiences, gain mentorship, and receive guidance from those who have faced similar challenges [10]. This support system can be invaluable, offering both emotional encouragement and practical advice. Many companies are adopting this strategy to create a chain of support for their employees. Universities have developed programs to support and advance women undergraduates, graduate students, postdoctoral researchers, and faculty [33]. Government or research associations also play a pivotal role in creating large extended communities across different countries to increase collaboration and support on a large scale [22]. In other cases, instead, women's networks are promoted by the women themselves, usually as a response to perceived advantages that men are thought to derive from the existing implicit networks in the field [10].

Networking activities are also a way for women to gain more visibility. As mentioned by Kovaleva et al., women often do not explore entrepreneurship because of a lack of social support, role models, and success stories [31]. The exchange of experiences and ideas boosts women's contributions in the field, making them great candidates as guest speakers for talks, meetings, or tech events. Moreover, networking activities provide a relatable environment in which to meet peers and professionals to join a collaboration.[1] Facilitating inter- or intra-company networking events for women has been shown to be an effective way for women to gain confidence and knowledge to boost their career growth [1].

One example of a company which is seeking to put these principles into practice is Rubrik,[2] which has won awards in 2024 in both India and the USA as a "Great Place to Work". This cybersecurity company invests in building a community among women and their allies within company, through its employee resource group, Women@Rubrick. This group seeks to create a sense of belonging, advance professional growth for women and their allies within the company, and connect women across the tech industry. It does this through actions such as workshops, speaker events, mentoring and showcasing.

[1] https://www.forbes.com/sites/forbesbusinesscouncil/2022/02/15/women-in-tech-why-and-how-to-gain-visibility/?sh=3aea2aa72940.

[2] https://www.rubrik.com/company/careers.

12.3.2 Leadership Training

Leadership training for women in IT is growing in popularity around the globe. These include training and programs to pursue leadership in careers in specific fields like cellular and mobile technologies [47], and cybersecurity [25, 40]. There are also training, and programs for women in informatics focused broadly on entrepreneurship [18] and leadership [35].

Leadership and mentorship programs have a positive impact on the career paths of women in IT, helping them develop leadership skills, build professional networks, and advance into leadership positions [15, 17, 21, 37, 42]. Below are some examples of successful programs and case studies that highlight this impact:

- Telia Sonera, a Swedish multinational telecommunications company, has developed a managerial program that emphasizes equal opportunities and gender balance. Through participation in this program, women discover their leadership potential and are encouraged to apply for managerial positions [15]. The program helps define professional goals and gain the confidence necessary to achieve them [21].
- Fraunhofer Gesellschaft, a German research organization, has developed an initiative that achieved 30% female researchers (compared to an average of 17% in other German institutes) by offering flexible work programs and childcare services in the workplace [15].
- IT for She, a Polish program, supports women who want to start a career in IT through annual technology camps, programming workshops for students, "Kids in IT" initiatives where volunteers teach programming to children, and mentorship programs offered by top companies [12].
- AAFCS Leadership Academy, an American Association, combines leadership training, mentorship, and networking opportunities. Participants have improved their self-confidence and leadership skills, and developed a professional network [42].
- Women TechEU [17] is a European initiative that provides coaching and mentorship for start-ups in the advanced technology sector led by women.
- Women2Invest (EIT) [17] is a European initiative that helps women take their first steps as entrepreneurs by providing training in the investment field and facilitating connections with investors.
- "You in IT" (Aj Ty v IT) [20] is a non-profit organization in Slovakia that offers training courses for women in IT, including software testing academies and data analysis.
- Female Entrepreneurs of the Future [20] is a public-private initiative in Germany that provides coaching for female entrepreneurs.
- 3-month re-skilling programs for women called Digital Academies (with over 1000 graduates), which embed mentorship by experts from industry as the backbone of the programs. These programs are run by Czechitas (based in Czech Republic) non-profit organization [6].

We thus identify the benefits of leadership and mentorship programs:

- Development of leadership skills, as through specific training women learn how to lead, manage, and motivate a team.
- Building professional networks since participants come into contact with other professionals in the field, creating a valuable network of contacts.
- Improving access to opportunities which can help counteract gender stereotypes and encourage women's participation in the IT field.

12.3.3 University-Industry Partnerships and Initiatives in IT and Gender Equality

The collaboration between universities and industry, especially in the IT sector, can take various forms to stimulate innovation and economic development. As shown in [46], Internship and Mentorship Programs provide students with opportunities for practical learning and valuable industry connections. Additionally, joint research projects benefit from the mutual expertise and resources of both sectors. Furthermore, as indicated in [8, 44, 46], universities can transfer technologies and knowledge to the industry through licensing, spin-offs, and other mechanisms. In most European countries, including Netherlands, Finland, Denmark and Italy, industry participation in university research is a common practice, with technology transfer offices at all universities [46]. These types of collaborations occur worldwide, and as mentioned in [3], many companies have been aiming for decades to transform education by focusing on the skills needed for a global, knowledge-based economy.

Studies presenting these types of initiatives emphasize the extreme importance of adapting collaboration initiatives to the specific context of each country or region, taking into account factors such as governmental policies, economic development level, organizational culture, and promoting gender balance, which is the subject of this section. In this context, university-industry collaboration initiatives must actively include and promote the participation of women and other underrepresented genders in STEM.

There are multiple mentoring programs for female students at various universities and institutes [21], all aimed at supporting students in their career development and facilitating their integration into STEM fields. Typically, individual or group mentoring is provided by industry professionals or experienced academic faculty. Main activities include personalized guidance, training, workshops, networking sessions, and examples of best practices [8]. Those discussed above are just a few examples of programs that promote gender equality in partnerships between universities and industry. Such initiatives are important to combat the underrepresentation of women in scientific and technical fields, to create a more diverse and qualified workforce, and to stimulate innovation and economic growth.

12.3.4 Social Initiatives

Social initiatives to improve gender balance have begun to take shape, partially motivated by the United Nations Sustainability Goal 5: Achieve gender equality and empower all women and girls.[3] To help address this objective, the Organisation for Economic Co-operation and Development (OECD) developed the "OECD Toolkit for Mainstreaming and Implementing Gender Equality Implementing the 2015 OECD Recommendation on Gender Equality in Public Life".[4]

The specialized literature contains multiple references (e.g., [19, 30, 41, 43]) highlighting the importance of governmental actions in boosting female participation in various fields, including STEM. For example, in [19], governmental programs are mentioned that encourage women to take leadership positions in local government (Germany) or promote women's access to education and technology (Botswana, Nigeria, Rwanda) [43]. Another important aspect is the role of public funding programs in supporting women's participation in research and innovation, including in fields such as ICT [20, 45].

The European Commission Directorate-General for the Information Society and Media [21] reports that in Finland there is a law that mandates companies to implement a gender equality action plan. This plan must include an analysis of the current situation, specific goals, measures to achieve them, allocated resources, training for employees, and monitoring. Also in [21], a German government initiative called "Girls' Day" is described, during which research institutes like Fraunhofer open their doors to showcase IT career opportunities to girls. A noteworthy situation is in Malta where the Maltese government's efforts are substantial in the process of providing childcare services to support working women, including in the IT field [21].

In She Figures [20], a correlation is drawn between investments in research and development and the gender distribution among researchers. Countries with higher spending on research and development tend to have a lower representation of women in research. This horizontal segregation also manifests in research and development (R&D) fields. In most countries and economic sectors, men are more likely to work as researchers in natural sciences, engineering, and technology. Increasing women's participation at all levels of research and innovation (R&I) holds strategic importance for the European Union. This importance is highlighted by Priority 4 of the European Research Area (ERA) [20], which aims for gender equality and the integration of the gender perspective in research.

One of the first countries to create a national gender quota policy was Norway. Casey et al. write, "The Minister of Trade and Industry steered a quota law through Parliament in 2003 that amended the Companies Act to require companies to appoint 40 per cent of the under-represented gender to their boards" [7].

[3] https://sdgs.un.org/goals/goal5.

[4] https://www.oecd.org/gov/toolkit-for-mainstreaming-and-implementing-gender-equality.pdf.

This policy took effect in 2004. As an indirect result, women are thriving in boardrooms, representing 45% of board composition in 2022.[5] The effects in pursuing informatics careers has also been seen with women representing 20% of the informatics workforce in 2018. In addition, 36% women could be seen in docent and professor positions in STEM fields.[6]

All these examples show that governmental policies play an important role in promoting gender balance in IT and other fields, and there is a need for government involvement in creating a conducive environment for women's participation in IT. Implementing effective governmental policies and concrete measures, such as mentorship programs, support for work-life balance, and proactive measures to increase the number of women in leadership positions, is essential for creating a more equitable and inclusive tech sector.

12.4 Methods

EUGAIN is a cost action project aiming at improving gender balance in Informatics at all levels through the creation of a European network of colleagues working at the forefront of the efforts for gender balance in Informatics in their countries and research communities (please refer to the first chapter of this book for more details on EUGAIN project). One of the objectives of EUGAIN was to gather a collection of initiatives, programs, policies, and projects that aim to include more girls and women in informatics in European countries. A small team of researchers from Working Groups 4 and 5 were assembled to accomplish this task. The overall design of the work undertaken represents a grounded approach to data collection and analysis to be as informal and accommodating to submitted responses as possible. A survey was conducted using targeted and snowball sampling to achieve this goal, aligned with a grounded approach. This section describes the population we selected, the design of the survey, and the data analysis methods used.

12.4.1 Population

This study had three distinct target groups. The initial target population for this project was the membership of EUGAIN. A link for collecting projects and initiatives was distributed to all members attending the 2023 annual meeting held June 12–13 in Rome, Italy. The second target group was presenters and attendees of ACM womENcourage 2023 in Trondheim, Norway, 20–22 September 2023. The

[5] https://www.spencerstuart.com/research-and-insight/nordic-board-index/diversity.

[6] https://kifinfo.no/en/content/statistics.

final target was selected presenters at the European Informatics Leadership Summit, hosted by Informatics Europe, held 23–25 October 2023 in Edinburgh, Scotland.

Recipients of the targeted emails were encouraged to complete and share the survey with colleagues or complete the survey with one of the Working group team members. As a result of the low submissions, completed projects found on the Informatics Europe Minerva Award repository were also included with applicant consent.

12.4.2 Data Collection

The survey was intended to be simple and short. Modeled after the Hawai'i Government Employee's Association (HGEA)[7] form for designing public policy initiatives and the Open Territories Toolkit,[8] the survey was initially designed to collect policy interventions but expanded to include initiatives, programs, and projects that were intended to improve gender balance in informatics fields across a number of different contexts. The questions were semi-structured and open-ended, allowing for a range of responses that are hard to capture for multi-disciplinary, international, multi-stakeholder collaboration. Each question included a description and example to assist in completing the form with ease. The questions can be seen in the appendix.

12.4.3 Analysis

Because of the unique circumstances and target population of this study, these results are not generalizable. However, best practices and themes can still be identified in the dataset. We accounted for this in our analysis methods. We employed descriptive statistics to present the submitted initiatives, programs, policies, and projects as well as thematic analysis using a structured coding schema. Testimonies and lessons learned are presented as cases, selected for their overall sentiments and experiences that may be examined using other lenses and theories.

12.4.4 Data Privacy

Because all information about the projects are public record and identifiable online, no data management plan for privacy was required.

[7] https://www.hgea.org/.

[8] https://toolkit.territoriaperti.univaq.it/.

12.5 Results

In total, 39 responses were submitted between May 2023 and April 2024. Given that the interventions are the unit of interest, respondent demographics are not presented here.

12.5.1 Demographics

Interventions elicited had durations from as little as 6 months to over 27 years. The total direct participants across all interventions reported are 126,226 with 135+ cumulative years of intervention. At least 325 partners are impacted across 25 initiatives, programs, policies, and projects. While 18 projects are completed, 21 are ongoing at the time of writing. Of those, 5 are newly proposed or have not yet started running.

12.5.2 Costs

Costs of interventions range from 0 to €1,000,000 per year, with an average of €75,700 over 18 projects. This figure excludes projects with an unstated annual budget for staff. A cost per year breakdown can be seen in Table 12.1.

Of these programs, some are offered in companies, others in universities, and some in partnership with other domains. By examining the beneficiaries, it is possible to identify the overlaps in populations served across domains.

Table 12.1 Total number of projects by reported costs

Cost per year	# of projects
NA	16
blank	8
0.00	2
Under 10,000	3
10,000–99,999	3
100,000–199,999	2
200,000–299,999	0
300,000–399,999	2
400,000+	3
TOTAL	39

12.5.3 Beneficiaries

Thirty target groups were identified across 39 interventions. The majority of interventions, 52.63%, served a single target group while 36.84% served two target groups. Interventions serving three distinct target groups represented 2.64% while 7.89% of interventions identified five or more target groups as beneficiaries. Table 12.2 highlights the total number of interventions by beneficiary in their domain of work. The column "Exclusively Female" indicates the total number of interventions that target only women and girls. In the first row, for example, thirteen interventions targeted high school students as at least one of their beneficiaries. Of those, two interventions exclusively benefited girls (Figs. 12.1 and 12.2).

Over 126,000 beneficiaries were impacted by these initiatives to date. Some of the target groups can be seen in Fig. 12.3 and Table 12.2 (Figs. 12.4, 12.5, and 12.6).

Table 12.2 Beneficiaries by domain and number of interventions that target that group

Domain	Beneficiary	# Intervention	Exclusively female
Education	High school students	13	2
Education	Middle school students	5	5
Education	Primary school students	2	1
Education	Recent HS graduates	1	
Education	Teachers	2	
Education	Vocational school students	1	
Government	Public administration	2	
Industry	Companies	1	
Industry	Staff of location	3	
Society	Media	1	
Society	Pregnant women	1	1
Society	Underrepresented populations	4	3
Society	Whole population of a region	2	
Society	Women (general)	3	3
Society	Women and under-represented groups	1	1
Society	Women in specific domains	5	
Society	Young adult up to 20 yo	2	
University	Researchers	2	1
University	University departments	1	
University	University faculty and Staff	6	2
University	University students	11	3
University	University-Industry partnerships	1	
Unique	Crosses domains with groups	3	

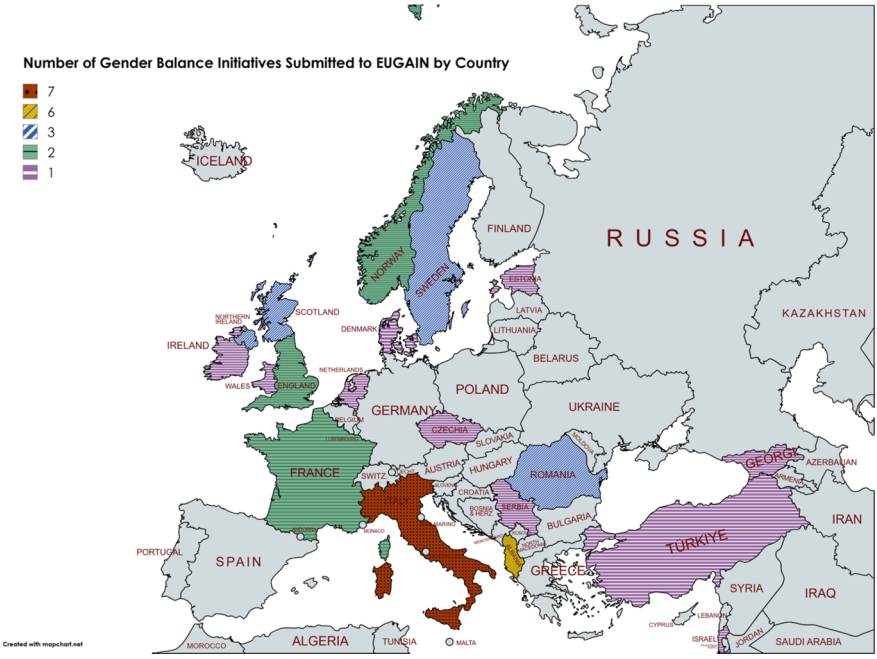

Fig. 12.1 Map depicting the number of initiatives, programs, policies, and projects by country (from Fig. 1, licensed under CC-BY-SA 4.0). Created with mapchart.net (https://www.mapchart.net/)

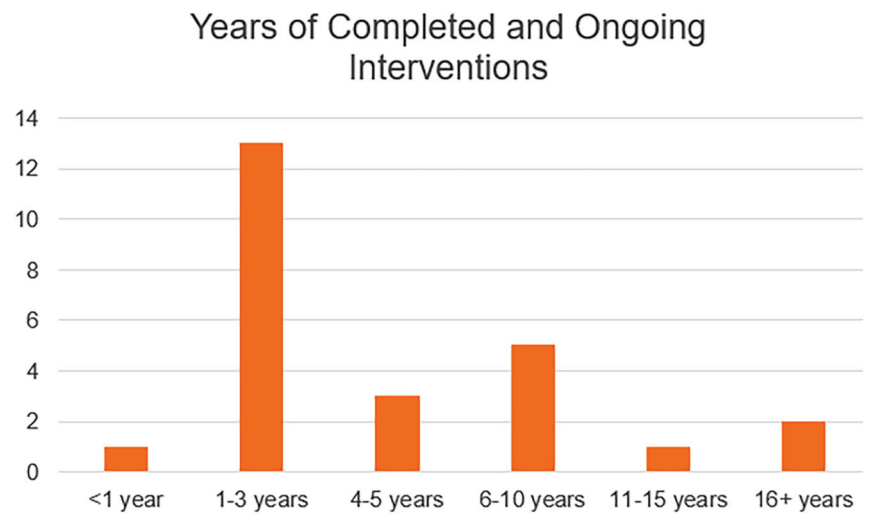

Fig. 12.2 Number of completed and ongoing interventions by years running

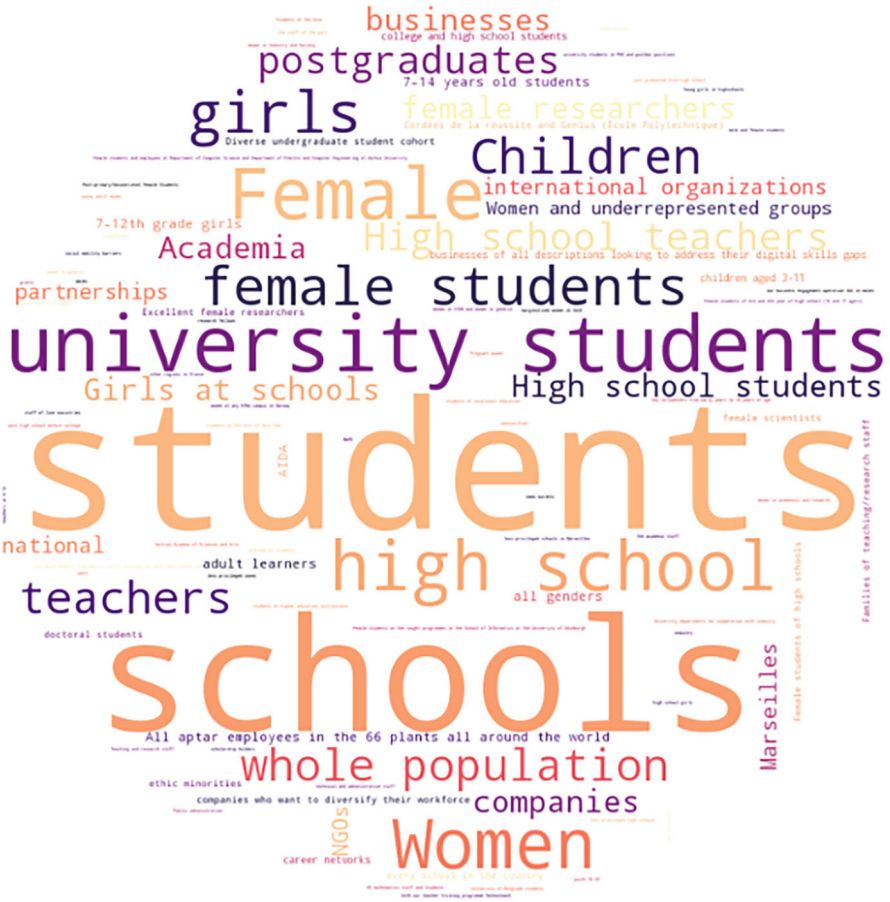

Fig. 12.3 Beneficiaries of the 39 identified initiatives, programs, policies, and projects

12.5.4 Case Examples: Initiatives, Programs, Policies, and Projects

Analyzing the results from our open survey conducted within EUGAIN and additional studies, we present and discuss a series of successful programs that promote gender equality in partnerships between universities and industry:

The Diversity Program by Motorola Poland aims to stimulate high school students' interest, paying particular attention to girls, in the IT field. The competition was launched in 2000, initially limited to four high schools and 120 participating students. Later, the program expanded nationwide [15].

The Roberta Program at Humboldt University in collaboration with Fraunhofer Gesellschaft, aims to increase the number of women in the field of

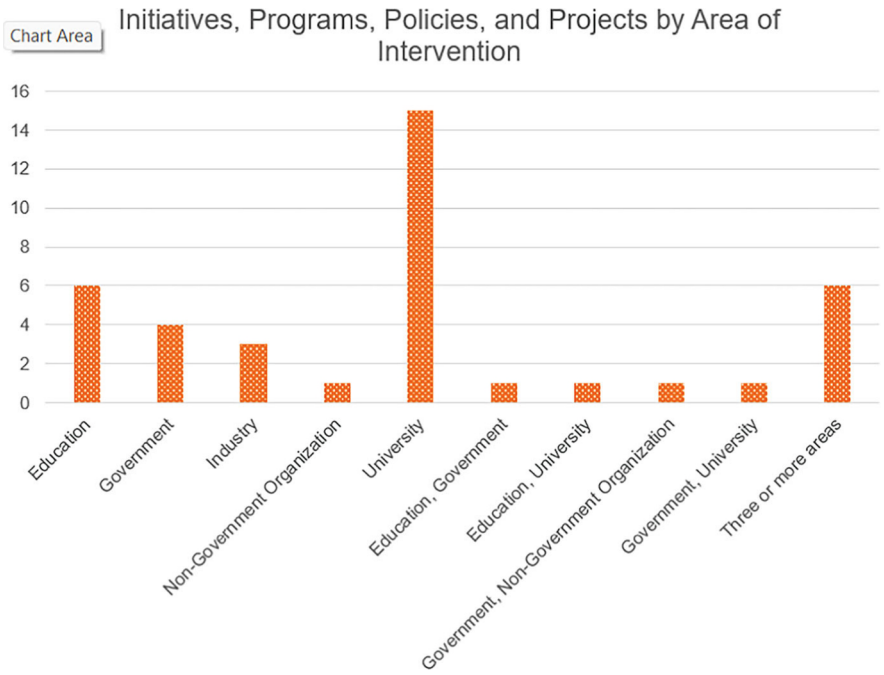

Fig. 12.4 This figure depicts the initiatives, programs, policies, and projects by area or domain of intervention. Single areas of intervention include primary and secondary education (named Education), Government, Industry, Non-Government Organization, and University. This is followed by two areas of intervention and three or more areas of intervention

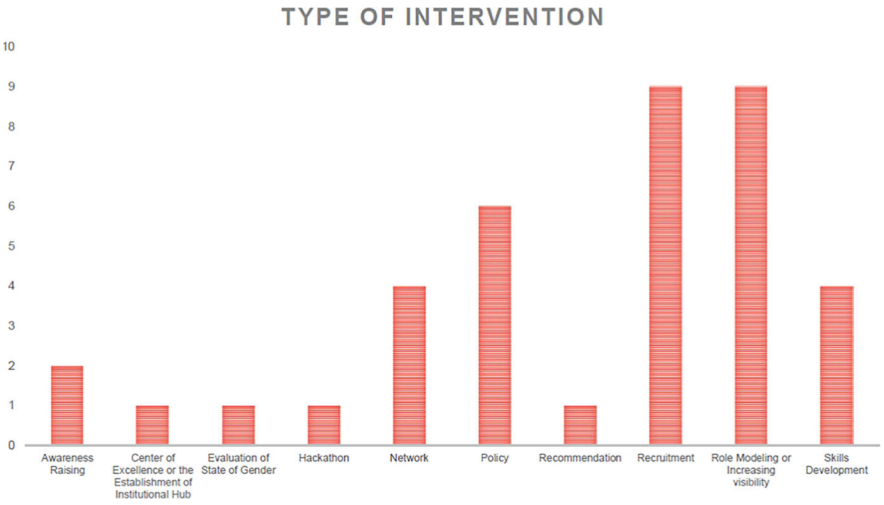

Fig. 12.5 Initiatives, programs, policies, and projects by type of intervention

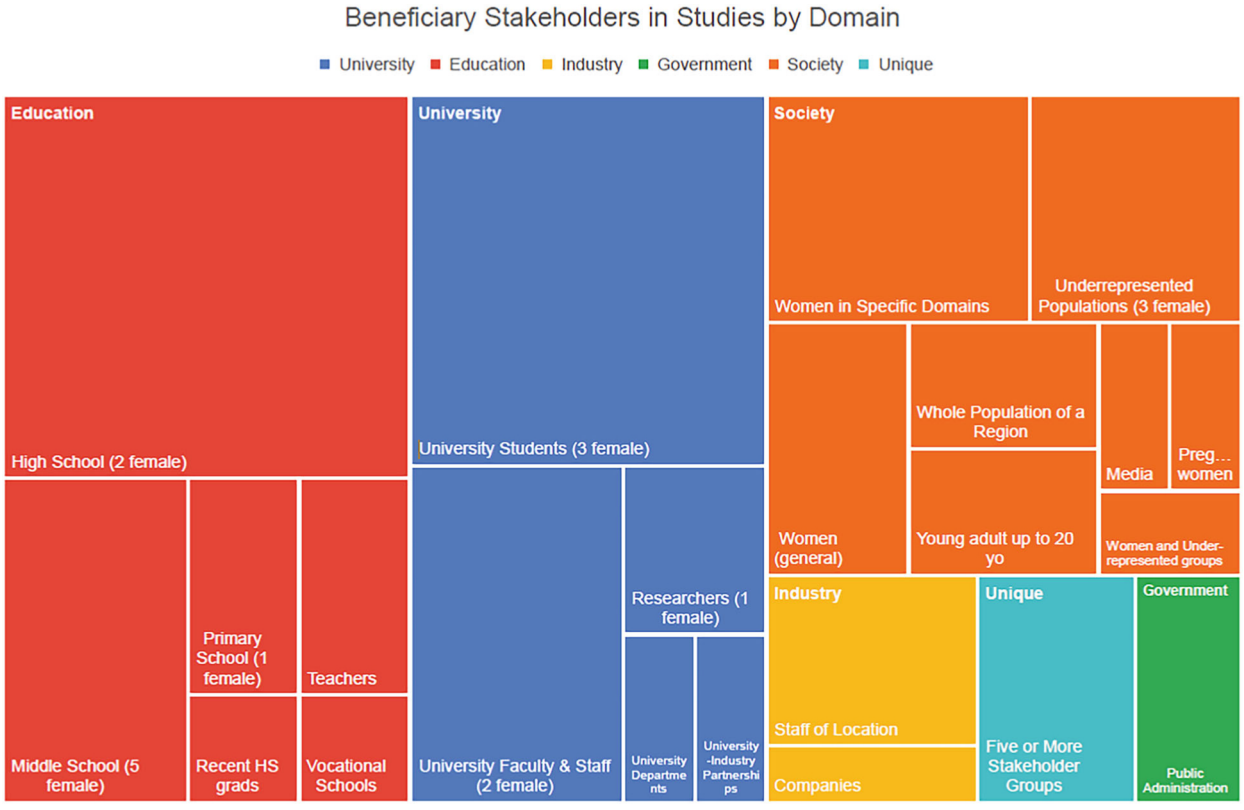

Fig. 12.6 Beneficiary types by area or domain of intervention

computer science. The target audience includes high school girls. The main objectives of the program are:

- Early cultivation of computer and robotics knowledge,
- attracting girls through engaging programs,
- familiarization with university computer science studies,
- facilitating the transition from high school to university,
- increasing the number of female computer science students,
- creating equal opportunities for women and men, and
- raising men's awareness of gender equality.

To achieve these objectives, ongoing activities include: consultation, guidance, working groups, training, courses, internships, open house days, school visits, and mentoring [21].

The FEET (Women Discover and Experiment with Technology) program at Leibnanch University in Hanover aims to increase the number of female students in the fields of electrical engineering and mechanical engineering. The target audience consists of high school girls (16–17 years old) who have chosen natural sciences as their speciality. This is an annual program, running from January to December, offering a variety of activities for the 10 girl participants: presentations and workshops at high schools to spark interest in technical fields, visits to the university, participation in selected university courses (real-life simulation, one day), key skills seminars (one day), company visits, and interesting trips (one day) [21].

The GE Women Network promotes presentations by women in the IT field in schools and universities, working to change perceptions about IT jobs and combat stereotypes. The working mode includes visits to schools and universities, presentations about careers at GE, with a focus on successful female role models.

The Academia-Industry Scholarship for the Advancement of Women in Science and Technology in Israel was introduced in 2001. This program offers scholarships to support young researchers to engage in joint research with industry. The funding aims to help these researchers develop connections and gain experience to support their careers and assist these women in reaching leadership positions in the industry [20].

The FEMtech Career projects in Austria are supported by the Research Promotion Agency to help companies with research activities and extra-university research organizations implement measures for equal opportunities through their FEMtech Career projects. Companies can apply for funding up to 50,000 EUR for 6–24 months for relevant projects. This includes training to increase gender knowledge within companies, human resources management (e.g., recruitment, branding), measures to increase the balance between professional and private life, measures to support employee development (e.g., mentoring), and support for improving internal and external communications [20].

The w-fFORTE program in Austria supports female researchers in science and technology through free training, workshops promoting interdisciplinary work, and networking events for women. Between 2008 and 2018, the program pro-

vided 15 million EUR for funding the Laura Bassi Centre of Expertise programs. This funding supported research based on the potential and current achievements of the selected researchers, focusing on supporting excellent female researchers and promoting a culture of collaboration and equal opportunities [20].

We also identified programs from our own members. They include:

Women in Cybersecurity—Role models for girls (Estonia) The main goal of this program is to combine relatable educational material, engaging activities, and inspiring stories from diverse female experts in the field, empowering girls to envision themselves as successful IT and cybersecurity professionals. This program was targeted to 7–12th graders and included tests like "Is IT for me?", reading materials, where you acquire expertise and skill sets, exercises, discussion materials. As artifacts to inspire more girls and women to pursue informatics careers, they collected personal stories from 59 role models and video stories of 6 to showcase top women in cybersecurity in Estonia [34].
Hack GRRRL (The Netherlands and Brazil) The main goal of the program was to increase the number of women in hackathons and give them the confidence to join hackathons in the future. Hack GRRRL helped overcome the confidence-competence gap, which is when you feel afraid of not having sufficient skills to complete a task you can do. This program was implemented by a Masters, now PhD, student. A next edition is being planned. The goal for the next iteration is to attract more participants and retain them in STEM fields. The cost to run the event in Brazil was approximately 2000 euros, but running the event online is free [38].
Gender Equality Plan (GEP) (Italy) In 2021, the Italian government implemented the indications of the European Parliament and enacted the National Strategy for Gender Equality.[9] The main goal of this strategy is to contribute to the promotion of gender equality and the achievement of equality, participation, and non-discrimination objectives. GEP 2021 has 26 goals and objectives grouped into 6 areas:

- Work/life balance and organizational culture;
- Gender balance in top management positions and decision-making bodies;
- Gender equality in recruitment and career progression;
- Integration of the gender dimension in research, teaching programs and training;
- Measures to combat gender violence, including sexual harassment;
- Communication and networking initiatives—internal and external networking measures.

[9] https://www.pariopportunita.gov.it/it/politiche-e-attivita/parita-di-genere-ed-empowerment-femminile/strategia-nazionale-per-la-parita-di-genere-2021-2026/.

This national strategy was adopted at universities like University of L'Aquila to benefit diverse genders in informatics education from high school through academic career. The budget for the GEP in 2022 was 127.000€.

These initiatives, programs, policies, and projects represent a collection of experiences that share lessons learned, best practices, and future perspectives about the landscape of gender balance in informatics across Europe.

12.6 Discussion

It was challenging to get people to submit their initiatives, programs, policies, and projects or best practices. This can be for a variety of reasons. Mostly, people did not feel their work was a good fit. In these cases, we asked for the link, and one of our team members completed the information for the program if we felt it was appropriate. This aligns with the idea that work to advance the standing of women and gender balance in tech is undervalued [5].

12.6.1 Lessons Learned

Lessons learned represent room for future growth. First, there is the need to emphasise that gender is a spectrum. By acknowledging there is more than just a gender binary, we can create room for trans, gender-queer, and non-binary individuals in informatics as well. This is an important lesson that we prioritize using a gender-forward intersectional approach to examine workplace dynamics and culture, training and mentorship. and other recruitment, retention, and promotion plans in informatics.

From the IPSIS program in Albania, the main lessons were ownership and to promote better involvement of high decision-making people. In order to have a successful system, everyone must feel a connection to it, and the system has to have the support of those who not only fund it, but those who embed its use into policies, practices, and habituation.

One survey respondent noted that helping people break out of the user role is challenging. They note, "Even though people like ICT, they don't think it's for people like them." This sentiment expresses the challenges and limitations from social narratives that some people place on themselves, illustrating the obstacles we must overcome in recruiting the next generation of informatics and ICT professionals.

Finally, many stakeholders and decision-makers are in areas where gender stereotyping is seen as the norm. In these countries, the presentation of data may help to make decisions for gender balance. One participant noted, "There is still a big gap... between men and women in engineering and ICT fields. In some areas

of a country, persistent gender stereotypes are existing in the education system...” This is an urgent hurdle to overcome. It is a societal issue that we can hope to incrementally impact over time. Presenting best practices and examples can help to create change, making informatics and ICT professions more inclusive for women and other marginalized genders.

12.6.2 Best Practices

Analyzing successful programs, as they have been presented both in the studies conducted and by respondents of our survey, has helped us identify good practices in collaboration between academia and industry:

- Early Industry Involvement is important to define the industry’s needs and set common goals from the beginning of the collaboration, ensuring that the needs and perspectives of all groups, including underrepresented ones, are considered. Some examples include partnership activities like creating a bridge program for students and industry teams or creating working groups of faculty and leaders to identify points of stress.
- Effective Communication relies upon establishing clear and regular communication channels between partners, including measures to ensure equal participation of all genders and diversity in communication teams. This can be reinforced through clear and transparent policies about harassment, open communication, and work responsibilities. Some of these can be created collaboratively.
- Mutual Trust means building a relationship based on trust and transparency, promoting an inclusive environment where all individuals, regardless of gender, are treated with respect and fairness. This can be reinforced through policies and trainings.
- Institutional Support involves creating structures and mechanisms to facilitate collaboration, such as technology transfer offices, technology parks, and dedicated funding programs, taking care to include specific initiatives and resources to support gender balance and equal participation in all stages of collaboration.

These principles will not only stimulate innovation and competitiveness but will also contribute to creating a more equitable and inclusive collaborative environment.

We outline a series of strategies for creating a more inclusive work environment that values diversity and offers women equal opportunities for professional development:

- Mentorship programs, especially those led by women in the STEM field, can be beneficial for women in IT [48]. They can provide support, advice, and role models. However, it is important for mentorship programs to address structural inequalities and not just focus on the perceived deficiencies of women [27]. A feminist approach to mentorship, which focuses on transforming the workplace and promoting the rights and needs of all employees, can be more effective [27].

- Developing recruitment policies that promote equal opportunities. Job advertisements should be gender-neutral and should not discourage women from applying. Companies should also consider using recruitment methods that reduce the risk of discrimination, such as structured interviews and objective competence tests.
- Training and career development programs should be equally accessible to women and men. It is also important for women to have access to equitable promotion opportunities and not be excluded from informal power networks within companies [15, 21].
- Balancing professional and personal life through offering flexible work options, such as remote work, flexible schedules, and paid parental leave, can contribute to creating a more inclusive work environment for women. These policies can help women balance their professional responsibilities with family duties.
- Combating gender stereotypes and discrimination at work is essential. This can be achieved through awareness campaigns, employee training, and clear policies against harassment [5, 15, 48].
- A greater representation of women in leadership positions can help create a more inclusive organizational culture. Companies should set concrete goals for increasing the number of women in leadership positions and implement programs that support women in their careers.

Diversity is not simply a goal in its own right. It has been demonstrated to have significant benefits for organisations as well as individuals.

12.7 Conclusion

The present work aimed at presenting the landscape of policies and best practices currently interesting women in informatics. The chapter delves into the current initiatives involving industry and academia collaboration. The analysis presented 39 initiatives involving several beneficiaries and stakeholders across multiple countries. The findings of this study are constrained by several factors that may limit their generalizability. While best practices and recurring themes have been identified, they may not fully capture the complexity of gender balance initiatives across different settings. Additionally, the responses and lessons learned were presented based on cases. While these offer valuable insights, they reflect subjective perspectives of the stakeholders involved that may vary when examined through different theoretical lenses. Nevertheless, the study is the first attempt to map the different collaboration initiatives aimed at improving gender balance, and provides valuable insights to practitioners and researchers that aim to investigate further the effectiveness of these interventions.

While we want to remain optimistic, we must critically reflect on how some nations view gender as a social construct. These limiting beliefs will have lasting ramifications, especially as we further embed technology into our society through digitalization. As one EUGAIN respondent writes, "...I have a big concern regarding

the concentration of women and girls in traditionally female-dominated fields of study and their under-representation in science, technology, engineering and mathematics and information and communications technology, which reduces their employment prospects. Therefore, I think it is very important to develop concrete recommendations and support projects based on it, in order to reduce this difference to a minimum." Women and Girls in Tech (Georgia). We share this sentiment.

The under representation of women in STEM, particularly in fields like informatics and ICT, continues to pose significant barriers to achieving gender balance. This issue contains deeply ingrained societal perceptions about who "belongs" in these fields, perceptions that discourage women and other marginalized groups from pursuing careers in technology. A crucial takeaway from our study is the importance of creating inclusive frameworks that address these societal narratives and promote gender diversity not only through policy but also through cultural changes. We promote collaboration across sectors, with universities, government, and industry working together to create lasting change. Mentorship and leadership programs tailored to the needs of diverse gender identities, as well as polices promoting flexible work environment will be keys to retaining talent and fostering diversity in the workplace.

12.8 CRediT Taxonomy

Conceptualization, Formal Analysis, Investigation, Methodology, Project Administration, Writing- original draft, Writing—review and editing: Lenuta, Antinisca, Alicia, Jane.

Visualization: Alicia.

Writing—original draft, Writing—review and editing: Claudia, Andrea.

Appendix: Survey Questions

The survey questions were:

- Name (What is your name?)
- Country (What is the main country of the initiative?)
- Email (What is the best email to contact you if we have questions or would like to follow up with you?)
- Your area of specialization (What type of organization do you currently work in?) [multiple options, structured responses: Education K-12, Government, Industry Non-Government, Organization, University, Other- to be added in notes]
- Area of intervention (What is the area where the intervention or recommendation was applied?) [multiple options, structured responses: Education K-12, Govern-

ment, Industry Non-Government, Organization, University, Other- to be added in notes]
- Intervention Type (What is the intervention?) [multiple options, structured responses: Hackathon, Policy, Recommendation, Project, Evaluation of the State of Gender, Role Modeling or Increasing Visibility (no direct connection), Mentoring (direct contact between mentors and mentees), Skills Development, Training or Workshop, Networking or Sense of Belonging, Awareness- Raising or Educational Campaign, Center of Excellence or the Establishment of Institutional Hub, Recruitment, Other- to be added in notes]
- Title of Recommendation or Intervention (The title is the name of the project.)
- Goal of Recommendation or Intervention (The goal is what the project is designed to accomplish.)
- Link and/or Description of Recommendation or Intervention (Provide a URL and/or brief overview of the project, recommendation, or intervention.)
- Beneficiaries of the Recommendation or Intervention (Who was the target population in the recommendation or intervention?)
- Your Testimonial for the Recommendation or Intervention (Your short personal opinion about the recommendation or intervention.)
- If this recommendation is part of a completed action or program, how long was the program or intervention? What was the total number of beneficiaries or participants?
- If this recommendation is part of a completed action or program, what were the program costs and lessons learned?

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