CLOSING THE GENDER GAP IN DIGITAL TECHNOLOGIES

"no one left behind" | 2030 Agenda

PORTUGAL INCoDe.2030

ACTION PLAN
|Proposal|

Sofia Marques da Silva
University of Porto, INCoDe.2030 – Axis 1 | Inclusion
Porto, July, 2018

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Contents

OVERVIEW

This plan is a proposal answering to the challenge to the Ministers of Science Technology and Higher Education of all Member States addressed by the Commissioner for Digital Economy and Society, Mariya Gabriel.

Even numbers of men and women using the same type of technology; of girls and boys in the tech-related education fields; of women and men in the tech-related professions are relevant indicators that may be considered to evaluate the gender gap in one given context. This proposal is a plan that aims to contribute to increase the number of girls and women in tech fields. It is also a proposal fully aware that equality of opportunities is not only about numbers, but also about equal distribution of power. The first and more direct challenge is to tackle structural constrains and inequalities and also the difficulties in making girls and women picturing themselves in STEM and ICT roles (Microsoft, 2017; 2018). However, the main challenge still is to generate inclusive opportunities for girls and women to participate; to increase the number of opportunities to be gendered, allowing that both men and women may be engaged in purposeful and significant education and work activities. Finally, this effort is not about dissuading men and boys, is about attracting girls and women.

The action plan is organised into different sections. A first part tries to demonstrate how this plan is integrated in wider and structural policies for equality promotion taking place at national and at the EU level. A second section is discussing the end of line problem - lack of women and girls in IT education fields and careers – by analysing its impact in women and girls' opportunities to participate, in economy and in the wider society growth. A third part is dedicated to understand the real situation, mainly in Portugal and Europe, and unpacking the problem by discussing and showing recent figures on gender bias and stereotypes, underrepresentation and segregation in education and labour market. We will be stressing the persistence of inequalities and resistance to change. The following part is dedicated to advance some solutions by addressing structural difficulties. The last part of this plan includes a typology of actions aiming to address identified problems, to target different groups and to involve different stakeholders. The action plan has actions to each thematic typologies (ex: raising awareness actions, etc.); transversal actions, as the mentoring programme and the pilot proposal; and some one-off and independent actions. In the end references that supported this document are mentioned.

This action plan gathers actions that aim to:

Contribute to challenge stereotypes.

Contribute to the promotion of digital skills and education.

Contribute to advocate for more women entrepreneurs and in leadership.

KEY INFORMATION

The problem

- Underrepresentation of women in tech field both in education and workforce.

The whys

- Persistence gender stereotypes.
- Persistence of glass ceiling effect.
- Persistence of gender pay gap.
- Persistence of stereotypes related to tech organisations and tech jobs.
- Persistence of gender bias.

The persistent obstacles

- Lack of role models.
- Lack of equal growth opportunities for women.
- Lack of mentors.

- Lack of sponsors.

The key-drivers influencing girls and women engagement in tech (Microsoft, 2017).

- Female role models.
- Practical experience and hands-on-exercises.
- Real-life applications.
- Confidence in equality.

Global aim of this plan

- To promote equal representation of girls and women in tech field – education and labour market.

Specific aims of this plan

- Fighting dual stereotypes: gender stereotypes and students/families/teachers stereotypes about the cultures of IT fields (Cheyran, et al., 2015).
- Promoting experiences with role models.
- Investing and promoting digital education and competence in women.
- Promoting women equal participation in education and industry workforce.
- Promoting women participation in entrepreneurship and digital innovation.

The overall strategy

- Engage young people (boys and girls), industry, families, schools and municipalities, and Higher Education Institutions.
- Foster, transfer and grow national level good practices and promising approaches.
- Compare to and advice from international programmes and initiatives.
- Foster inclusive environments for girls and women.
- Create opportunities for girls and women to engage in meaningful projects.
- Support activities as coding with personal and social interests.
- Encourage the involvement of female mentors.

Aligning with the 5 Axis of INCoDe.2030

A substantial part of the proposal is aligned with aims covered by the 5 Axis of the initiative, but mostly with Axis 1, 2, 3 and 4, corresponding to Education, Qualification and Specialization.

What have been done so far to put together this proposal?

1. Contacting coordinators of programmes in development in Europe to explore possibilities for future advice:

- EMEA Women in Leadership program of SYNOPSYS Leadership and career development and Women of Silicon Roundabout Maria Petrosyan Maria.Petrosyan@synopsys.com and Ruzan Nalbandyan, Ruzan.Nalbandyan@synopsys.com, US.

- Digipippi Mentoring Programme, Eva Fog, Founder and Chairwomen, eva@digipippi.dk, Denmark

- It for SHE, Mentoring Programme, Bianca Siwinska (b.siwinska@perspektywy.pl) and Małgorzata Szyszko (m.szyszko@perspektywy.pl), Poland

- I Wish' (Initiative for Women in STEM) Cork Institute of Technology. Norma Welch (Norma.Welch@cit.ie), Mary Moloney, Mary.Moloney@cit.ie>Michael Loftus Michael.Loftus@cit.ie; Ann OMahony (Ann.OMahony@cit.ie), Ireland.

2. Contacting coordinators of national programmes and initiatives to become involved:
• Geek Girls Portugal – Vânia Gonçalves (Founder), vania.goncalves@mil.up.pt

• Technovation Challenge – Armanda Rodrigues, a.rodrigues@fct.unl.pt

• Engenheiras por um Dia – IST[1], Helena Ramos (hgramos@ist.utl.pt); Palmira Silva (palmira.silva@cg.tecnico.ulisboa.pt)

3. Contacting the industry to become involved:
• Cisco, Sofia Tenreiro
• Bizdirect, Marisa Rodrigues, (marisa.rodrigues@bizdirect.pt)
• INNUOS, Algarve, Amélia Santos (asantos@innuos.com)
• Microsoft, Vânia Neto, (Vania.Neto@microsoft.com)
• Porto Tech Hub, Luís Neves (f.luis.neves@portotechhub.com)
• DefinedCrowd, Daniela Braga daniela@definedcrowd.com, to be contacted
• Altran, Célia Reis, to be confirmed

4. Collecting and analysing relevant data to have an accurate picture of the situation of women in tech in Portugal, Europe and beyond
Databases as PORDATA, INE, EUROSTAT, OECD statistics, DGE, MoE.

5. Literature review and document analysis
Scientific production; EU reports and agendas; Industry initiative research

6. Attending or Following Conferences
Women of Silicon Roundabout Conference
Women in Tech Conference
Digital4Her

7. Designing a pilot to experiment
In close contact with the Municipality of Viseu, the Polytecnic Institute of Viseu and some of the IT industries based in Viseu, a pilot project to be implemented is in progress. More information on the pilot in the section of this document dedicated to ACTIONS.

Companies' and levels of involvement

Cisco
Possibility to sponsor one Ada Lovelace award
Involvement of CISCO employees as HE female IT students mentors
Organisation of one Raising Awareness Action addressing 8th and 9th grade on career choices.
Involvement of the CISCO CEO Sofia Tenreiro in the programme task force.

Microsoft
Involvement in the task force of Vânia Neto, advocate for Digital Competencies and women in IT career promotion.

Bizdirect
Involvement of Marisa Rodrigues in the task force and in the organisation of one pilot (Viseu)

[1] https://www.itu.int/fr/ITU-D/Digital-Inclusion/Women-and-Girls/Girls-in-ICT-Portal/Pages/Portal.aspx

INNUOS, Algarve, through the involvement of the founder Amélia Santos in actions related to entrepreneurship

Porto Tech Hub, Luís Neves , helping to develop 2 communities. One to mentor girls and another to women and leadership.

Synopsys, with the involvement of Maria Petrosyan, SYNOPSYS, Sr. Manager/HR Business Partner Eastern Europe, TLD Lead EMEA to advise on leadership and mentoring.

Organisations to become involved

CIG
CITE

Government

Ministry of Science, Technology and Higher Education
Ministry of the Presidency and the Administrative Modernisation
Ministry of Education

Task force

Amélia Santos, INNUOS, Entrepreneurship
Armanda Rodrigues, Universidade NOVA de Lisboa, Mentoring
Cristina Quadros, Ordem dos Psicólogos, Vocational and career guidance
Cristina Ribeiro, Faculdade de Engenharia da Universidade do Porto, Mentoring and Raising Awareness
Eva Oliveira Polythecnic Institute of Cávado e Ave, Raising Awareness and Mentoring
Helena Santos, Instituto Superior Técnico, Mentoring
Maria Figueiredo, Polythecnic Institute of Viseu, Raising Awareness
Marisa Rodrigues, Mentoring, Raising Awareness
Nuno Rodrigues, INCoDe.2030 & Polythecnic Institute of Cávado e Ave
Palmira Silva, Instituto Superior Técnico, Mentoring
Sofia Marques da Silva, INCoDE.2030 – Axis 1 Coordination, University of Porto
Sofia Tenreiro, CEO, CISCO (to be confirmed), Mentoring and Leadership
Susana Sargento, Universidade de Aveiro, Leadership and career development
Vânia Oliveira, Geek Girls, Mentoring and raising awareness

I.
FRAMING THE ACTION PLAN
Answering national aims in digital sector for girls and women and alignment with European and other international commitments

The National Strategy for Equality and Non Discrimination 2018-2030 – Portugal + Equal (Portugal + Igual), approved 11th of January of 2018[2], aims to fight against inequalities, discrimination educational and professional segregation based on gender differences and stereotypes. These problems are creating inequalities for men and women to fully participate in the wider society, being necessary to "eliminate all structural obstacles" (2018: 12), following the 2030 Agenda principle of "No one left behind". This is included in the 5th objective of the Sustainable Development Aim – Reach Gender Equality and Empower all Women and Girls.

The National Plan for Equality Between Women and Men[3] aims, among others, "to guarantee conditions to a full and equal participation of women and men in the labour market; to guarantee an education free of gender stereotypes. Additionally, aims to promote a media free of sexist stereotypes and committed with equality between women and men. Integrating gender into policies, practices and processes and deconstructing gender-based stereotypes in language, discourses, media is crucial in this process. We need a better representation of women in science and technology.

The risk of gender stereotypes is very clear in the concerns of the Council of Europe Gender Equality Strategy 2018-2023. The Strategic Objective 1 is precisely to Prevent and Combat Gender Stereotypes and Sexism. In close relation to the main objective of the present plan proposal, which is to increase the number of girls and women in tech fields, the risk analysis in the above mentioned strategy, considers that:

"Gender stereotypes and sexism are reinforced by the inadequate portrayal of women in media, by the negative role of Information Communication Technologies (ICTs) and by lack of action regarding education policies" (Council of Europe Gender Equality Strategy 2018-2030, 2018: 44).

This document presents several actions that are integrated in the mitigating actions of the above-mentioned strategy (*Idem* and *Ibidem*: 44):

- Targeting relevant actors, including the private sector for awareness raising activities.
- Promotion of relevant standards regarding gender stereotypes in the media and in education.
- Identification and promotion of good practices regarding the media, ICTs and education policies.

The Government of Portugal is fully committed in solving different types do inequalities and discrimination by trying to address structural inequalities already identified. This is translated into the **Objective 5 of the Sustainable Development Agenda 2030**: to achieve gender equality and empower all women and girls that cover private and public spheres, job market and education, participation and health. One of the strategic aims of the National Strategy for Equality and Non Discrimination 2018-2030 – Portugal + Equal is to guarantee the conditions for a full and equal participation of women and men in the labour market. Several actions are planned to fight against sexual segregation in professions.

Specifically, this action plan answers to two convergent Axis and orientations included in The National Strategy for Equality and Non-Discrimination 2018-2030-Portugal+ Equal. The **Axis 2** aims to

[2] https://www.portugal.gov.pt/download-ficheiros/ficheiro.aspx?v=c6788127-27ae-41a8-8e60-40d3403f48c1

[3] The National Strategy for Equality and Non Discrimination (ENID) – Portugal + Equal is a new programmatic cycle aligned with the Agenda 2030 for the Sustainable Development and sustains in three National Action Plans that define strategic and specific objectives related to equality among women and men_ (IMH) ; prevention and fight against women and domestic violence (VMVD) and fight against discrimination based on sexual orientation, gender identity and sexual characteristics (OIC).

ensure the full participation of women and men in public and private sphere, promoting equal participation and opportunities in the labour market and professional careers. **Axis 3,** which refers to scientific and technological development future oriented, highlighting the aim to promote equal participation in the digital process and to use the potential of the technological development to promote equality.

This action plan aims to follow the strategic aim of integrating the Perspective of Equality Between Women and Men in Higher Education and Scientific and Technological Development and the measure 4.1.1. Development of actions to promote digital competences of women and girls in ICT within the initiative INCoDe.2030, namely within its Axis 1 (Inclusion).

The approach of this plan is…

This proposal, aligned with EU guidelines to overcome the lack of girls and women in ICT education fields and jobs, is organised under three dimensions, already mentioned by the Commissioner Marija Gabriel during the Digital4Her event:

1. Challenging stereotypes.
2. Promoting digital skills and education, because the number of women in ICT related HE decreased since 2011.
3. Advocating for more women entrepreneurs, because Europe can't afford women leaving digital jobs (European Commission, 2018).

Policies and intervention in one particular aspect related to the gender gap in IT needs to be integrated in a wider perspective understanding inequality, segregation and discrimination as a result of intersected inequalities that are experienced differently by people. The possible solution of this problem involves policy makers, educators and the school system, ONGs, parents and communities (Microsoft, 2017)[4]. Isolating the problem will isolate and blame women and girls by their choices and will contribute to increase and reproduce stereotypes and, therefore, to increase the lack of opportunities.

To guarantee that women and girls are fully taking part it involves the convergence of policies in different fields (education/qualification, family shared responsibilities, labour market, research) and corresponding contexts of practice (schools, industry, families, HEI). This approach is very much aligned with the ENIND priority of developing strategic partnerships and networks distributing responsibilities. This is not an isolated problem as it is integrated in a spectrum of structural inequalities.

Therefore, we believe that the problem needs to be tackled from different angles as proposed by Wayra UK[5], that has been considered a successful example by implementing an organisational culture based on the promotion and the integration of diversity, not only but also gender diversity, considered an innovation driver. The McKinsey & Company 2018 report on *Delivering Through Diversity* (Hunt et al., 2018) is clear in showing how diversity impact in companies performance as they attract more talent, increase the employees satisfaction; improve costumer orientation, etc., indicating that "there is a penalty for opting out" (Hunt et al., 2018: 1). In the same subject, but for the US context, a study from Intel and Dalberg (2016) concludes that "advancing diversity in tech is good for citizenship, good for business, and good for the national and international marketplace"[6].

On this matter of the benefits of diversity, the Commissioner for Digital Economy and Society, Mariya Gabriel, during the Digital4Her event that took place in Brussels on 19th of June (2018), considered that it is a paradox that being the digital and technological a sector of innovation it is not a diversity sector.

Actions need to be systemic and systematic, by addressing structural and cultural change related with gender social relations. The most important set of actions needs to be related with fighting gender stereotypes, which is one of the strongest factors that causes for the lack of girls in IT. That is included as

[4] Portugal was not surveyed in this study by Microsoft
[5] https://wayra.co.uk/uk-more-diverse-than-other-major-start-up-ecosystems-including-the-us-silicon-valley-nyc-and-tel-aviv/
[6] https://www.dalberg.com/our-ideas/decoding-diversity-financial-and-economic-returns-diversity-tech

one of the aims of the UN convention for the elimination of all forms of discrimination against women (CEDAW) to which Portugal is committed, starting with the Beijing Declaration and Platform.

Finally, this action plan is aligned with several commitments at European Level, namely with the Council of Europe Gender Equality Strategy 2018-2023 adopted at 7 of March of 2018 by the Council of Europe Committee of Ministers.

II.
THE IMPACT OF GENDER INEQUALITY:
A matter of justice, a matter of economic growth

Why do we need to solve this problem?

Being the technology a key sector for economy is crucial to understand how women are adjusting to technology. Therefore, the "inclusion of women in the digital world, through increased access to internet and increasing opportunities to study ICT subjects, is an empowering process" (EIGE, 2016: 3). This access will have impact in other dimensions and opportunities for women's lives, as education, information, business opportunities, and innovation. Furthermore, the impact is not only directly in women's' lives but in their families and communities (EIGE, 2016).

Why Girls in ICT matter?

However, this is not only a women's matter. It is not by chance that the key sentence during the Digital4Her was "Their fight is our fight". Closing the gender gap in ICT is a matter of inclusion and social justice. It is also a matter of understanding economic and social returns of having more diversity in, as indicated in 2015 in the *Diversity Matters* report that accounts a research to understand the correlation between levels of diversity[7] and company financial performance (Hunt et al., 2015). Diversity and inclusion needs to be integrated while imagining, developing and creating products. Ground-breaking technologies require having diversity at the forefront and need to be developed under an inclusive mind-set. The best products are those capable of addressing the needs of a wider and diverse population. In order to do that, different contexts, from education to companies, need to have inclusive and diverse teams.

Why is important to participate? Impact of gender segregation in study fields

One of the key drivers of innovation is diversity. The innovative dimension is a vision of the digital that is understood as an opportunity to create better opportunities to be competitive, to increase social cohesion, better education, better jobs, more opportunities and inclusion. The whole population, in its diversity, needs to be part of this. The situation today is that there are cutting edge technologies and digital solutions that are making a contribution to solve social problems. We need to show girls and young women how technology may have a positive social impact (Intel Corporation, 2014, enabling girls and women to fully participate. ICT is a cultural practice, rather than just a technical medium, shaping people relationships and their everyday life contexts.

ICT and digital technologies impact men and women differently, conducting to a situation in which women will benefit less from all the opportunities of ICT-intensive jobs and the digital (Hafkin; Huyer, 2008).

[7] Diversity is understood as "greater share of women and a more mixed ethnic/racial composition in the leadership of large companies" (hunt et al., 2015: 1).

The report on *Women in the Digital Age* includes several explanations on why women are not benefiting as much as men with the growing demand of technical profiles (European Commission, 2018): unconscious biases[8] on "women's capacities to lead and undertake" (European Commission, 2018: 97); group-think phenomena, that explain why in digital sector women tend to work in more feminized occupations, limiting their opportunities; the unbalanced share of caring responsibilities. This last one relates to the problem of conciliation of professional and personal life, leading women to consider that they have less conditions to career progression into senior management positions. Women are generally "employed in low quality digital jobs" (EIGE, 2016). However, the same report points out that women are highly motivated and they don't lack ambition (European commission, 2018).

Differentiated and segregated education pathways and study fields impact in:

- Employability.
- Differentiated payment.
- Differentiated representation in specific occupations.

Horizontal and vertical gender segregation works as obstacles to increase the number of ICT and STEM professionals, causing a shortage in those professionals. Reducing gender segregation in STEM education alone could create 1.2 million jobs in the EU (EIGE, 2017). The impact of the reduced number of girls in ICT fields:

- Makes it impossible to respond to the increasing demand of professionals in those fields.
- Women are missing well-paid and flexible jobs (Kalwarski et al., 2007).
- Products created by these jobs are shaping society and they need to be adequate to a diverse population (Margolis and Fisher, 2002).

Fostering economic growth

There are two distinct theories on the impact of gender gap in ICT. One considers that Gender Gap benefits economy. The other, based on recent findings indicates that Gender equality would have positive impacts in economic growth, namely by creating more employment and more jobs. Moreover, GDP would increase. The World Bank CEO, Kristalina Georgieva[9], said that "The world has a $160 trillion less wealth because of the fact that women don't participate fully in the labour force, and they are not paid equal to men".

It is well know the social and economic impact of the low number of women in tech careers. Portugal is one of the countries that would have a substantial positive impact if improving gender equality.

[8] In fact, this is considered the second-generation gender bias, as it is less explicit forms of discminitation reproducing gender stereotypes with impact in girls choices and employers that dont value de same way men and women.

[9] http://www.euronews.com/2018/06/05/the-astronomical-cost-of-gender-inequality

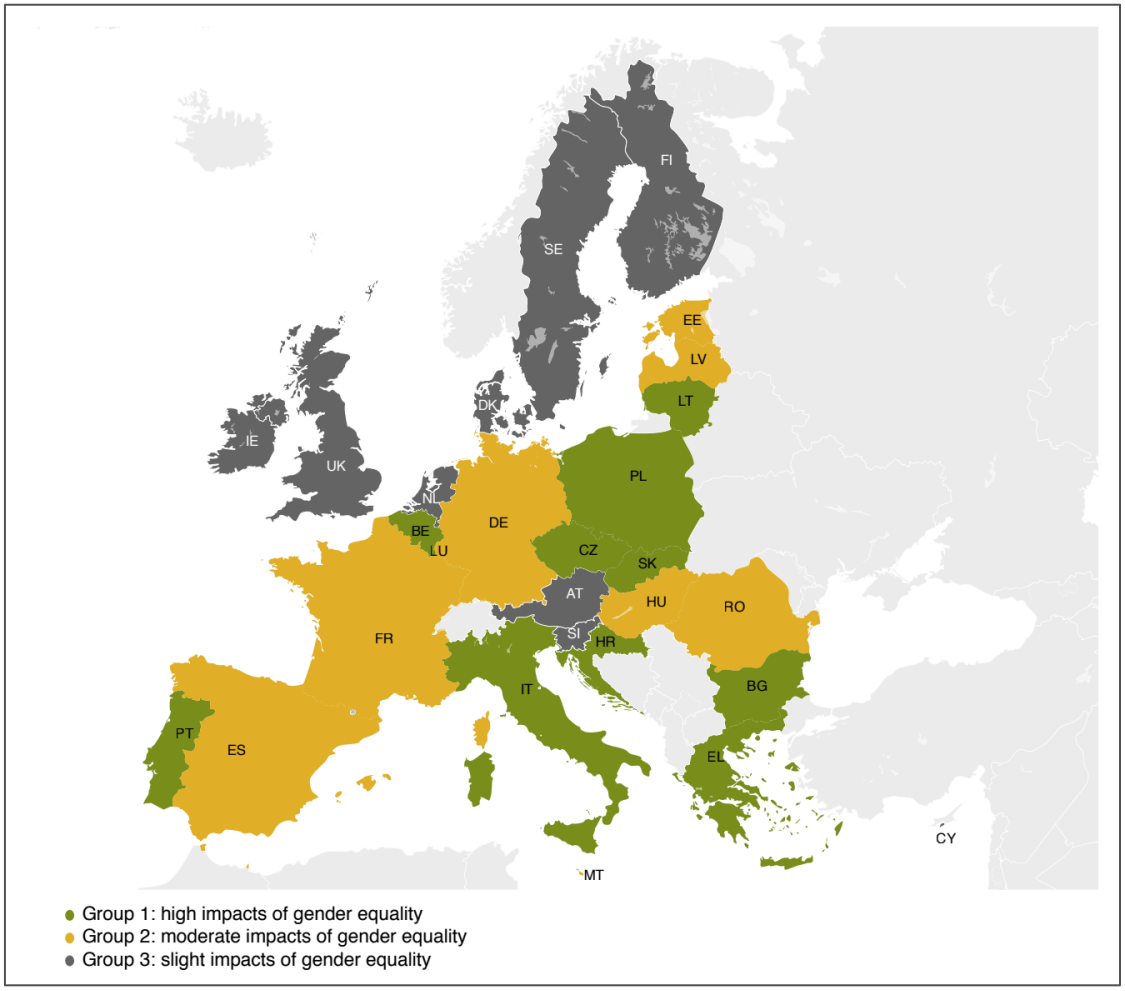

Figure 1: Impact of gender equality: differences across member States in GDP in 2030 (EIGE, 2017: 3).

A study by the European Institute for Gender Equality (EIGE) gives strong evidences related to the economic benefits of gender equality in the EU (2017). As indicated, "the employment rate in the EU will make a substantial leap if women have more equal opportunities in STEM education and the labour market" (2017: 1). Increase the number of jobs, new jobs occupied by women and consequence less risk of poverty are some of the benefits with economic impact. According to the same study, "by 2050, improving gender equality would lead to an increase in EU GDP per capita of 6.1-9.6 %, which amounts to EUR 1.95-3.15 trillion" (EIGE, 2017: 2). This impact is higher than when improving in educational attainment, leading to an extraordinary increase of the productive capacity. This also shows how inequality of opportunities is affecting countries economies. The same study by EIGE concluded that "more gender equality would lead to: between 6.3 million and 10.5 million additional jobs in 2050, with about 70 % of these jobs taken by women; positive GDP impacts that grow over time; an increase in GDP per capita up to nearly 10 % in 2050" (EIGE, 2017).

This information needs to be transparent to all countries and, particularly, to the private sector industry, that is contributing for sex segregated choices and low participation of women.

III.

WHAT DO WE KNOW ABOUT THE PROBLEM? Unpacking the Situation

Although women were pioneer in computer science, their interest declined in the 80's. Studies correlate this trend to the fact that home computers were advertised to boys for gaming and as a boy device.

Today, the western society has a problem of underrepresentation of women in ICT sector, causing for a slowdown in the digital development.

The gender gap in ICT technologies is holding back Europe, in general, and Portugal, in particular. Attracting more women for ICT industry is an imperative, being necessary to foster and develop talent and leadership. This is a worldwide problem, but Europe is already behind when compared to other international contexts. Europe needs 350.000 IT specialists and men cannot bridge this deficit.

A combination of factors over the course of a significant number of women's life contribute to persisting inequalities:

- Sex-segregated educational choices.
- Persistence of horizontal and vertical segregation.
- Low participation in the workforce.
- Persistence of a gender pay gap.
- Precarious employment and poor jobs.
- Unequal division of unpaid responsibilities within the household.
- More educational success is not translating into better jobs for women. Women also remain, on average, more likely to be unemployed than men with the same level of education.
- Education in techs is not having a high impact in changing the situation.

The problem is worsening.

In the USA the programme *Girls Who Code* are developing several surveys to have an accurate perspective on the situation of women in tech. From the figures, they made available though their website, is clear the fact that the gender gap in tech is getting worse[10]. For example, in **1995**, for the context of USA, **37%** of computer scientists were female against **24% in 2017**. Aligned with this situation a study in the USA developed by ISACA[11] - Connecting Women Leaders in Technology - indicates as the top barriers the lack of mentors, the lack of female role models in the field, gender bias in the workplace, unequal growth opportunities when compared with men and the unequal pay for the same skills (ISACA, 2017).

3.1. Underrepresentation in Education

Girls outperform boys in school education and use of ICT does not seem to have impact in school achievement. The graphic bellow shows the education attainment in Higher Education at EU level comparing with data from Portugal and Ireland (one of the countries with better results with girls and IT).

[10] https://girlswhocode.com/about-us/#the-problem
[11] http://www.isaca.org/info/2017-women-in-technology-survey/index.html

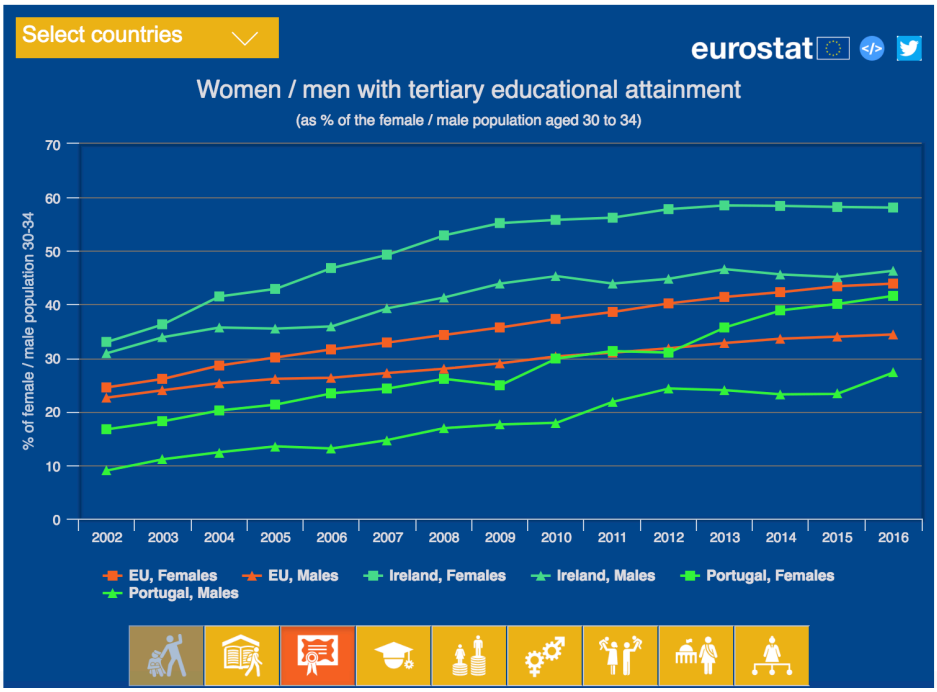

Figure 2:Percentage of women and men with tertiary education attainment in the EU, Portugal and Ireland from 2002 2016.

Results here are far from being a surprise, presenting a higher percentage of women enrolled in HE with a significant gap in the case of Portugal. When analysing the data concerning students enrolled in ICT education fields there is an also well-known gender gap, being the percentage of women much lower. The following figure shows the proportion of female ICT students in EU28. In Portugal, only 13.3% of students studying in ICT are female (EU 17%).

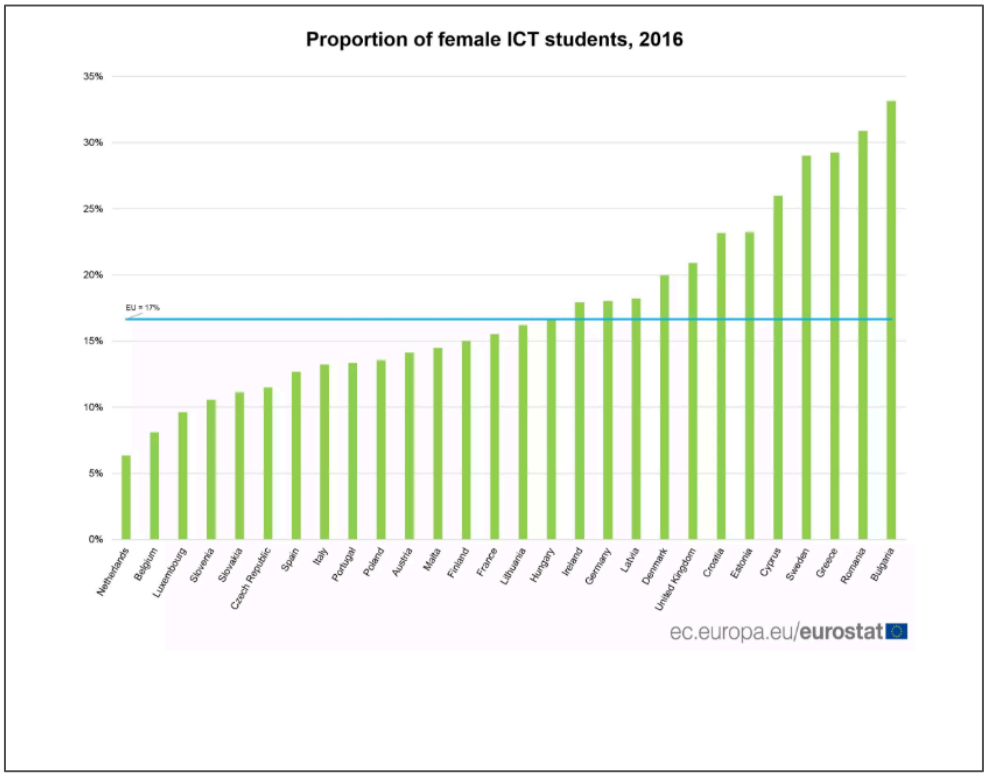

Figure 3. Proportion of female ICT students, 2016 (%)

The evolution between 2006 and 2016 of the number of women with an ICT degree in Portugal is worthy of concern. Portugal hasn't even reached yet the values of 2006.

Anos	Sexo		
	Total	Masculino	Feminino
2008	6.894	5.525	1.369
2009	4.986	4.032	954
2010	5.335	4.404	931
2011	5.196	4.273	923
2012	5.513	4.508	1.005
2013	5.756	4.711	1.045
2014	5.234	4.196	1.038
2015	5.155	4.199	956
2016	5.436	4.360	1.076

Diplomados no ensino superior em Tecnologias da Informação e Comunicação (TIC): total e por sexo
Fontes de Dados: DGEEC/MEd - MCTES - DIMAS/RAIDES
Fonte: PORDATA
Última actualização: 2017-10-16

Figure 4. Number of graduated Men and Women in Higher Education in ICT field between 2006 and 2016

The problem in lacking women in ICT is also a consequence of an unequal distribution of men and women graduated by field of education:

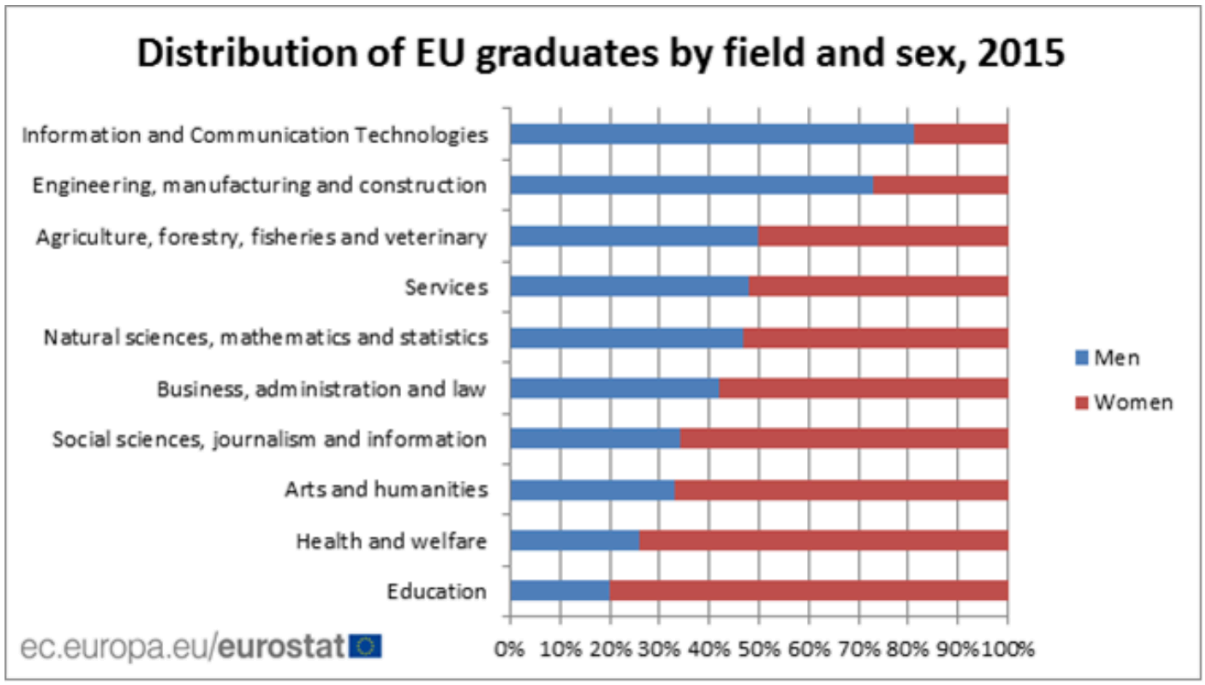

Figure 5: Distribution of EU graduates by field and sex, 2015 (%)

For 2015, and from OECD calculations, Portugal was indicated as one of the highest shares of women among its tertiary graduates in natural sciences, engineering and ICT (close to 40%). However, when disaggregating data by specific field of education the percentage of women in ICT drops to 0.9% of 40% and to 0,2% of all graduates in tertiary education in ICT (men are 0.9%) (OECD, 2017). The following table shows the distribution of female and male graduated in different fields of education in 2016.

	Year	Graduated Education and Training fields (2016)								
		Total	Education	Arts and Humanities	Social Sciences, Trade and Law	Sciences, Maths and Informatics	Engineering, Transform. Industries and Construction	Agriculture	Health and Social Protection	Services
F	2016	42 878	3 177	4 233	14 034	3 162	5 133	907	10 301	1 917
M	2016	30 208	684	2 642	8 157	2 505	10 412	509	3 004	2 287

Table 1. Number of graduated by sex: total and by education and training area (PORDATA – data from DGEEC/Med – MCTES – DIMAS/RAIDS (last update from 2017-10-27)

Gender segregation affects women's and men's equal opportunities in education, labour market and in other social contexts, narrowing choices for both men and women, leading to unequal pay, reproducing stereotypes and power relations. This is a vicious circle. Gender segregation is visible in **study fields**, **career choices** and **labour market.** Examples of skills gender segregated are ICT professionals; medical doctors; STEM professionals; nurses and midwifes and teachers.

3.2. Gender segregation in IT professions

In what concerns high-tech industry at EU level, only 14.8% of founders were female. In Portugal[12] and for 2015 (Eurostat) the rate of women entrepreneurs represented 36.2% against the highest, Lithuania with 39.5%[13]. When analysing figures on entrepreneurship from recent studies, Portugal is in the 6th position (from the 10th position in 2017) in what concern women as entrepreneurs (WIndex for Women Entrepreneur, 2018: 25). Portugal is considered a Strong Performer, being one of the strongest markets with an Index score of 69.1 (rank 6) and a Women Business Ownership score of 28.7 (rank 10). This position is calculated taking into consideration 3 components: High Income; High Women Business Ownership and High Overall Index Score. When it comes to Tech companies the reality seems a bit different. The same index refers that in Portugal "women exhibit a higher tendency towards micro enterprises than men (similar to the UK, Sweden, Italy, France, Denmark and Belgium). Most of these activities are in the Wholesale & Retail (43.7%), Government/Health/Social Services (22.8%) and Financial/Professional/Administration/Customer Services (15.3%) sectors, with ICT having the lowest representation at only 2.3% (Mastercard, 2018: 78).

[12] Accordingly with the European Tech Report 2017, Portugal is one of the countries with the higher percentage of founders that moved to another country to start-up, along with Greece, Italy and Spain with 17%. (Europe 21%). Nevertheless, accordingly with the same report, Portugal is included in the Top 10 of the fastest growing tech worker populations (2017) with 2.7% of growth. In the first place is Ireland with 5.3%. (Data are based on an analysis of sample pool of LinkedIn members and the difference between those in Oct 2016 working in the Tech Sector in each country from this sample pool and those in Oct 2017. Source: LinkedIn).

[13] The Mastercard Index of Women Entrepreneurs (2018) reports that "women's progress as entrepreneurs are not always aligned to the wealth and advancement of their respective economies. In fact, some of the highest rates of Women Business Ownership are observed in the less wealthy, factor-driven markets where women are driven to businesses out of necessity/need to survive (e.g. Ghana, Uganda, Bangladesh and Vietnam) (2018: 17).

According to Eurostat, main professions split along gender lines[14]. In 2016, only 26% of professionals in Science and Engineering were female against 74% of male professionals.

The problem of representation can also be seen more specifically in what concerns the distribution of ICT specialists by sex in 2016 in several EU countries.

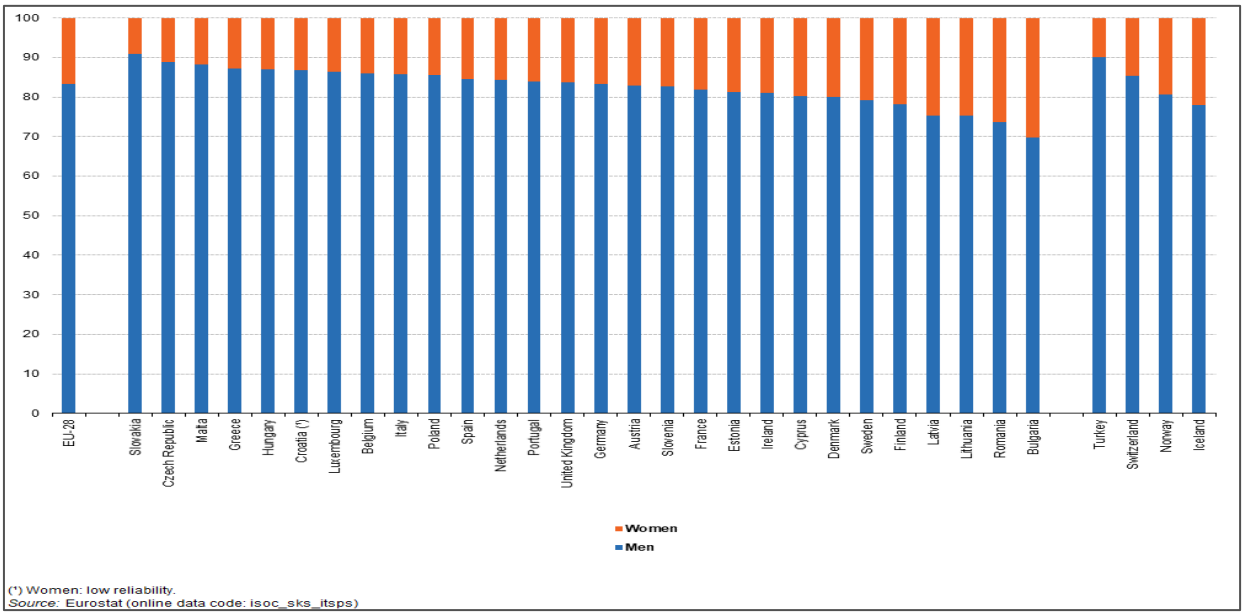

Figure 6: Distribution of ICT specialists by sex in 2016 in EU countries.

The underrepresentation of women is in **ICT** and **STEM** and the underrepresentation of men is in **health, education** and **welfare.**

Data from Eurostat shows that among 28 EU countries and between 2006 and 2016, in 23 countries there was a decreasing number of women specialists in ICT. Portugal, Holland and Luxemburg are those that had a small increase. Bulgaria, which has the highest rate, is stable (30.4 in 2016 and 30.2 in 2016). Countries as Czech republic, Hungary, Poland, Greece, Croatia, and Estonia show a high decrease in the number of women in ICT. Poland is the worst case presenting 33.0 in 2006 and lowering to 14.5 for 2016.

In Portugal, in 2017, and accordingly with Eurostat data, 14.4% of the employed ICT specialists were women (EU 17.2%) and figures show a decreasing number from 2016 to 2017.

Time	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Female	17.2	23.3	22.9	14.6(b)	11.9	11.6	13.7	15.3	16.1	14.4
Male	82.8	76.7	77.1	85.4(b)	88.1	88.4	86.3	84.7	83.9	85.6

Table 2: Eurostat: % of Employed ICT specialist by sex (%)

Time	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Female	1.7	16.3	16.8	9.7 (b)	8.9	9,6	15.1	15.9	17.5	15.1
Male	56.5	53.9	56.6	56.5(b)	65.9	73.4	95.8	88.3	91.3	89.2

Table 3: Eurostat: Thousand of Employed ICT specialist by sex (M)

Education is not helping…

It is a fact that the gender GAP in ICT is increasing. The study *Women in the Digital Age*, carried out for the European Commission (Quirós et al., 2018) indicates that the increase of digital education doesn't have necessarily a positive impact on employability for women, when compared with other studies areas. Investing in education alone in these fields is not benefiting women:

[14]http://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/EDN-20180307-1

> "The study shows that having a tertiary education increases employability for both men and women, regardless of the field; however, the effect of tertiary ICT-related studies on employability is small and only positive for men, while showing slightly negative results for women" (Quiró et al., 2018: 5).

According to this study, developed at European level, in 2017 women graduated in ICT were 24,9% and Women working in ICT jobs were just 13,0%. It is, however, important to be aware that the share of women among ICT specialists varies among European countries (EIGE, 2018). In Portugal the number is slowly growing since 2012.

Concerning the share of women among ICT specialists, the following figure shows some variability among countries with 11 countries decreasing the number and 14 countries increasing the number of women as ICT specialists. 3 countries presented stabled figures. Portugal is among those increasing that number but still in the 19th position.

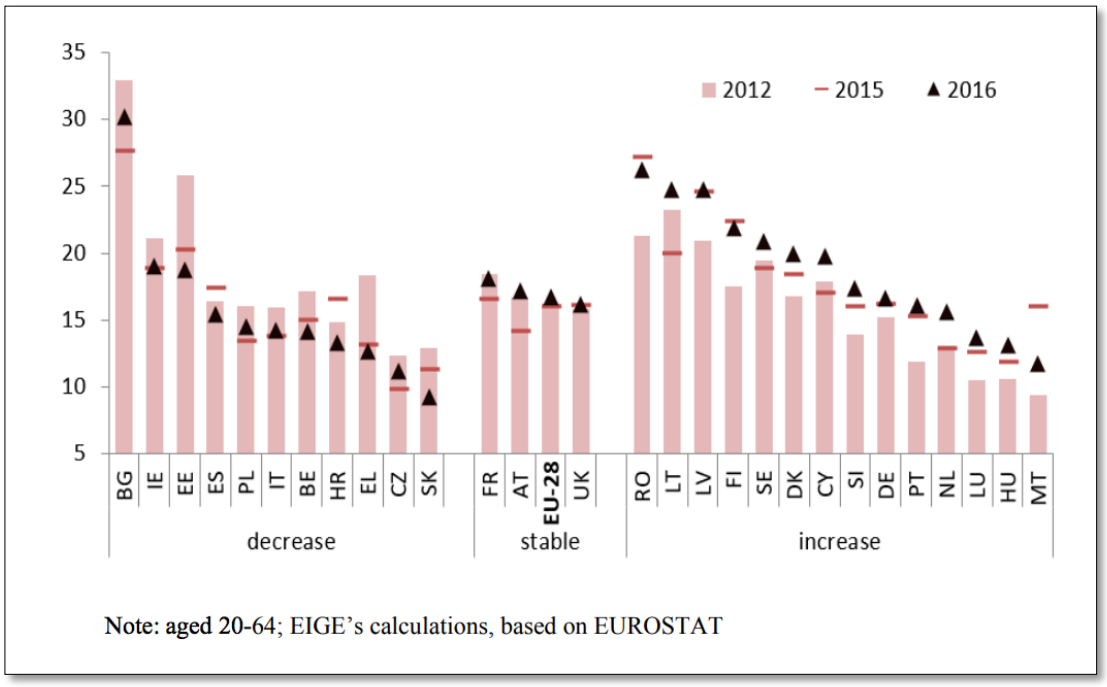

Figure 7: Share of women among ICT specialists in Europe (EIGE, 2018)

Other relevant data concerns women' positions in the industry. A study on gender balance in SMBs and the use and rate of technology adoption by Morning Consult (Jakimowicz et al., 2017) surveyed 6004 SMBs in France, Germany, Italy, Poland, Spain and the UK. One of the conclusions is about the relation between the education attainment and the position in the company:

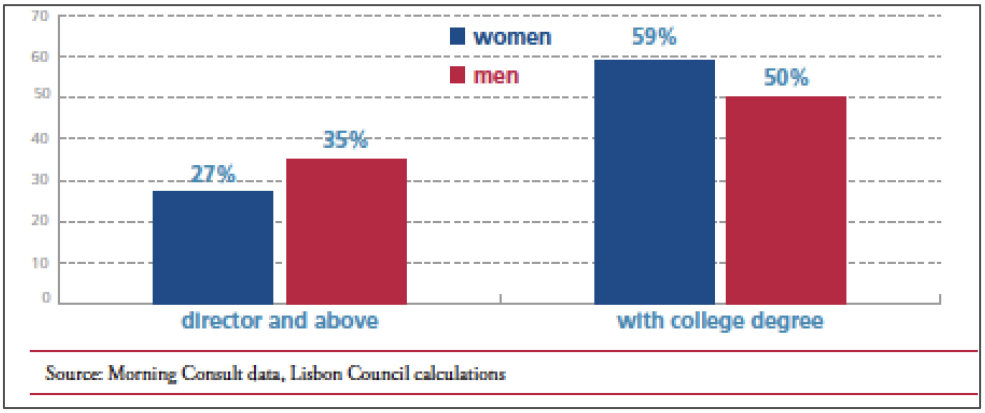

Figure 8: Position in the Company and Educational Attainment (2017)

Another study developed by a partnership with Atomico & Slush (2017), The State of European Tech, is very clear in what concerns the effect of glass ceiling and the little impact of the pipeline waiting, which may indicate that increasing the number of women in male dominated fields may not have the expected impact when considering top management positions (Schweitzer et all, 2011).

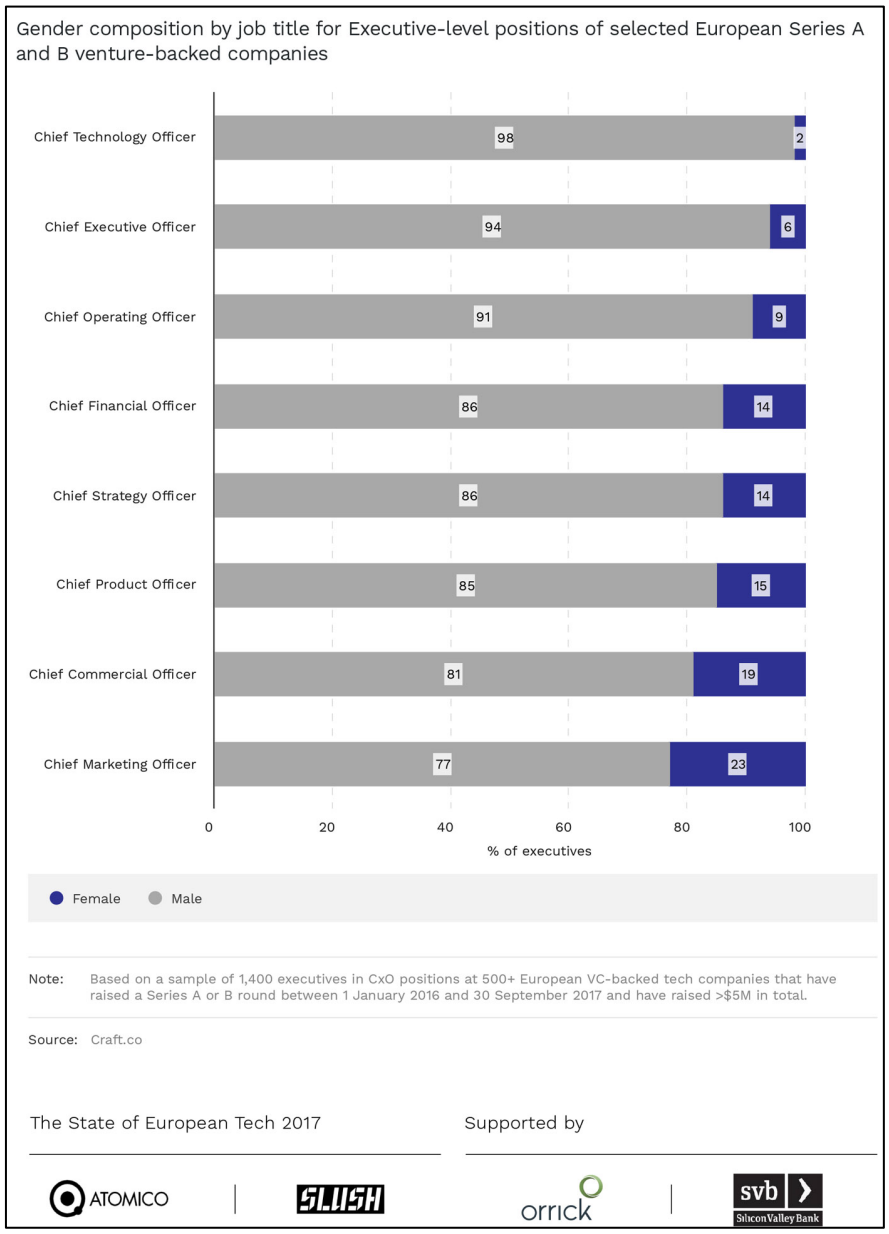

Figure 9: Gender composition by job title for Executive-level positions of selected European Series A and B venture-backed companies, 2017 (%).

Gender pay GAP…

Not only, but also as a consequence of what we have been presenting so far, Europe has still a problem to solve related to the gender pay gap. In 2016 the difference between average gross hourly earnings of male and female employees as % of male gross earnings were 16.3% (EU); **17,5% (Portugal);** 21,5% (Germany); 25,3% (Estonia). In 2018, the figures are, in what concerns Portugal, that women earn less **16%** than their male counterparts, but the gap increases among top management places, 26%. On July 2018 it was approved by the Portuguese parliament a law proposal that aims to fight

against gender pay gap guarantying to an equal job an equal pay. This will be done through, among others, making companies responsible by its implementation, transparency and accountability through the regular publication of statistics.

The problem of gender pay gap may be explained because women are choosing career pathways that are less well paid. In Europe 27 % of women against 15 % of men are very low paid, are working few hours per week or have low job security (EIGE, 2017).

The unadjusted gender pay gap, 2016 (difference between average gross hourly earnings of male and female employees as % of male gross earnings), is present in all European countries although values are very different: Romania, 5.2%; Ireland, 13.9%; Portugal, 17.5%; Germany, 21.5%; Estonia, 25.3%; EU, 16.3%.

An important result came from the OECD´s 2017 Science, Technology and Industry Scoreboard, showing that returns on ICT tasks are larger for women that for men in most OECD countries. This means that "ensuring that women are well equipped to undertake more technical tasks may help put them on the path to higher salaries" (Wyckoff & Centurelli, 2017).

Lack of diversity in the work force and wrong perception

Formal equality exists together with gender segregation in education and training. This is probably one additional reason on why wrong perceptions on the real situation persist. A study by Microsoft (2018) is showing concern about the difficulty in having a more diverse work force. The solution may rest in the investment in "STEM programs to help bolster the talent pipeline with more talented young women" (Microsoft, 2018: 4). However, there is an additional problem. **A study by** European Tech Report (Atomico & Slush, 2017) call the attention to the difference between perception and reality around gender diversity in European Tech. The percentage of women in executive-level positions is very low: 2% are CTO; 6% are CEO. This situation works together with the unconscious biases, reported in the study conducted by the European Commission on *Women in the Digital Age* (2018).

Tech community's perception is not aligned with the reality, as a study on State of Europe Tech, 2017) indicates: the majority has the perception that gender diversity is positively reflected in employee composition. Results shows that both male and female strongly agree that there is gender diversity and this is aligned with results by respondents' occupation:

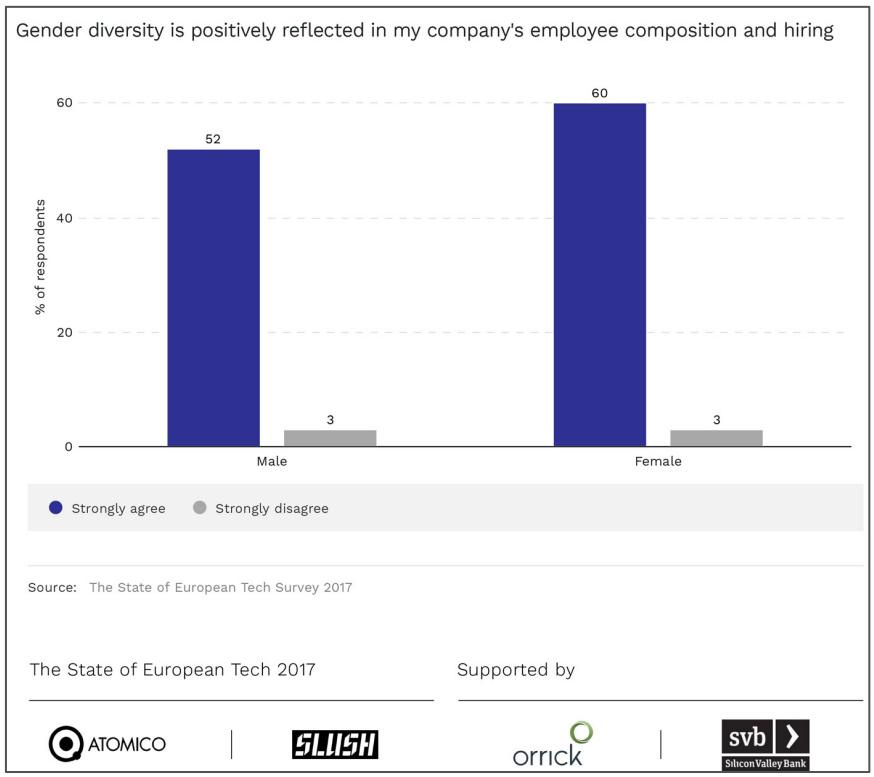

Figure10 Perceptions on gender diversity positively reflected in respondents' company's employee composition and hiring, by sex.

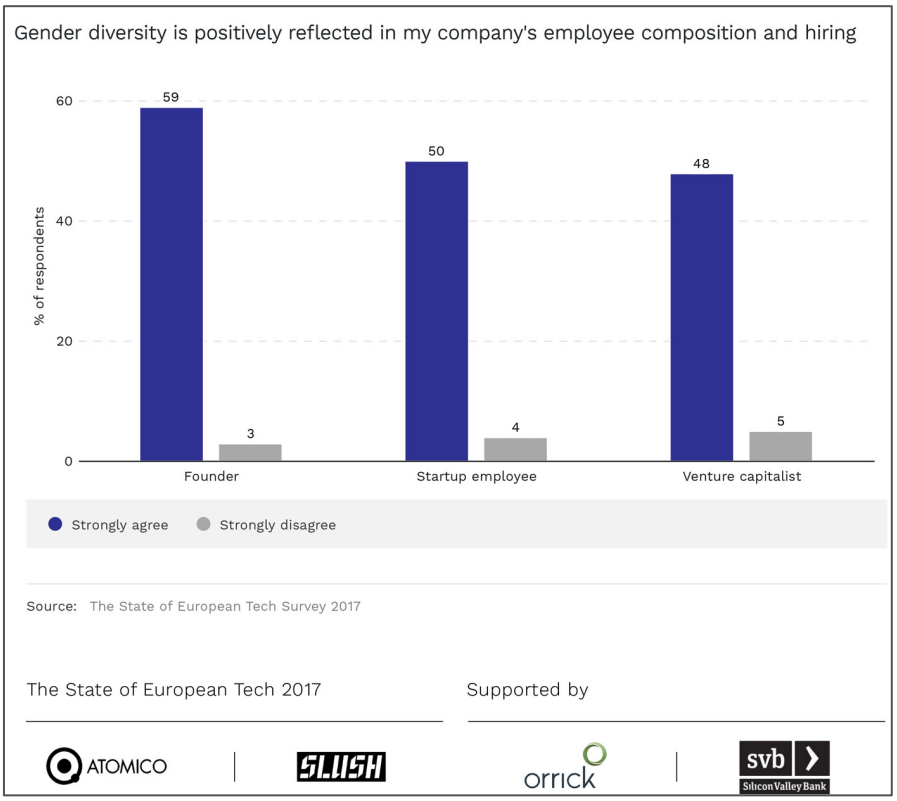

Figure 11 Perceptions on gender diversity positively reflected in respondents' company's employee composition and hiring, by sex and position

3.3. Explaining the problem: why are inequalities and stereotypes of segregation still persisting?

Structural explanations

Gender stereotypes, social expectation on gender roles, and lack of role models are some of the explanations to the fact that girls are not choosing STEM in general and computer science and digital tech, in particular.

School contexts are full of implicit stereotypes as Tuula Gordon and colleagues explain in an article on formal, informal and physic school (Gordon et al., 2000). Implicit stereotypes are in:

- Textbooks and curricula, being necessary a critical analysis of textbooks and curricula as well as pedagogic strategies in classrooms.
- Classrooms' practices and pedagogy, being relevant to develop actions in which boys and girls are exposed to tech jobs.
- Teachers, being necessary to raise awareness and competence on gender among teachers.
- Parents, peers' influence and expectations. Parents- along with teachers, parents have an important role in motivating or discourage girls (and boys) for specific interests. Their influence is of utmost importance.

Specifically, teachers' training is not including gender awareness and gender related topics. In their practices they are perpetuating gender stereotypes by stimulating girls and boys to get involved in gender based differentiated activities.

Outside school and education, but directly influencing educational choices, are what some authors consider to be "cultural stereotypes as gatekeepers" (Cheyran et al., 2015). Cheyran and colleagues (2015) argue that "stereotypes of the field act as **educational gatekeepers**, constraining who enters these fields, and that interventions to broaden the **cultural representation** of these fields can help to draw more diversity into them" (Cheyran et al., 2015: 1).

End of the line explanations: Explanations to gender-gap in STEM include several social factors. Lack of role models, and unawareness of opportunities related to those fields as well as views that associate computing to a *boys' thing*. Girls' socialization is causing their incapacity to build up expectations of self-efficacy in male dominated professions (Saavedra, 2009). We need to increase girls' sense of belonging in tech fields. Studies in the US context by Master and colleagues (2016) and Cheyran and colleagues (2015) points that girls are less likely to become engaged in computer science education fields, because stereotypes related to the field are indicating to them that they don't belong.

When analysing specifically the case of girls in IT several studies try to explain the persistence of the tech gender gap:

- The role of significant others: parents, teachers. Studies from the 90's already indicated that fact (Sadker & Sadker, 1994).
- Underrepresentation leads to underrepresentation (Marphy et al., 2007) as there is a lack of role models and familiarity.
- Girls underestimate their performance in these fields (Corremm, 2001).
- Perception of family and career conflicts.
- Discrimination in these fields with less professional opportunities for women.
- Women are penalized for exhibiting competence and leadership qualities (Rudman, 1998).
- Traditional mind-sets about computing (Kesar, 2018).

Moreover, for the Portuguese case, the anticipation of issues related to the balance between family and work and perceptions of discrimination in traditionally male professions may also explain (Saavedra, 2009).

Some practices from companies contribute to unbalance the relationship between family and job, which makes women less welcomed, as there is an unequal division of unpaid responsibilities. In 2017, the Portuguese Commission for Equality in Labour and Employment (CITE) expressed more than 700 opinions asked by employees aiming to have flexible working time. In general, those were a response to companies that refused to change to a more flexible option in what concerns working time[15].

IV.
WHEN WOMEN STOP CODING AND LOST INTEREST
Understanding to make changes

Understanding how a country may be able to solve the difficulty in motivating girls to tech education and careers is so complex as trying to understand what causes it. In order to solve the problem it is important to understand the situation; the structural factors underlying figures and to understand factors influencing girls' interests. The study by Microsoft on Why Europe's girls aren't studying STEM came up with relevant results in what concern STEM but that might be useful to understand ICT specifically:

[15] https://www.homepagejuridica.pt/noticias/2875-pais-de-menores-de-12-anos-tem-direito-a-horario-flexivel-mas-empresas-recusam

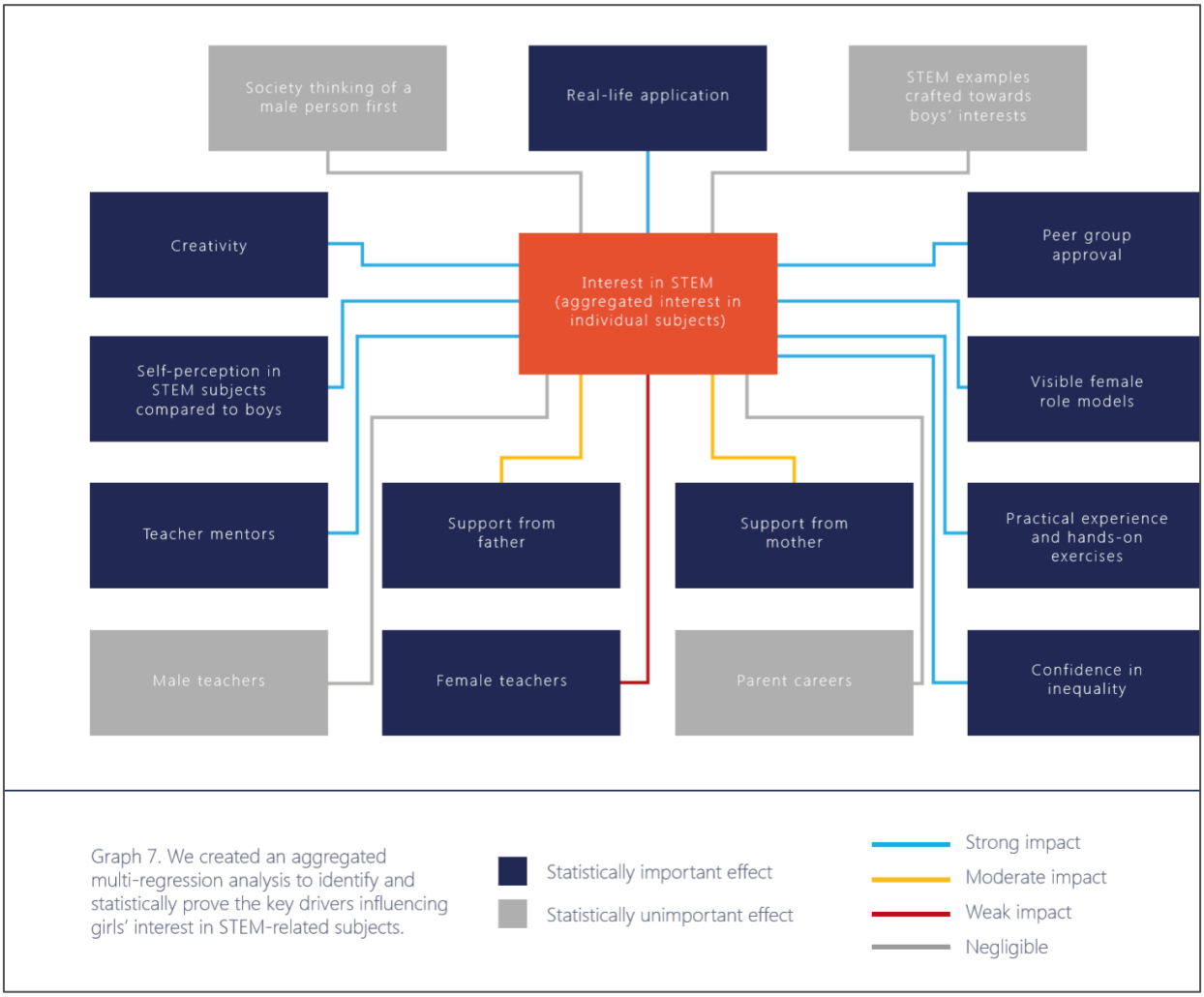

Figure 12. Factors with the strongest impact on girls' interest in STEM (Microsoft, 2017: 12)[16]

Aspects related to real-life application, self-perception in STEM subjects, peer group approval was some of those considered has having a statistically relevant impact in becoming interested in STEM. Peer-group approval, visible female role models, practical experience were some of the factors with the strongest impact in girls' interest in STEM.

4.1. Start early - reaching young people before 15 in education and school contexts

An online consultation in the scope o *Women in Digital Age* aimed to reach stakeholders concerning gender and equality in the ICT sector. The majority of respondents considered that educational institutions and media were the most relevant in empowering and promoting female participation in the digital world (European Commission, 2018: 116).

Long before, The Beijing Platform (1995) already indicated several critical areas[17], being **Education and Training of Women;** Women and the economy; Women in Power and Decision-making; Women and the Media, those that we believe the most relevant for the purpose of increasing

[16] This study included qualitative data (from FGD with 54 girls from 9 countries). The insights coming from the qualitative part of the study were used to develop the quantitative component that included a survey of 11,500 girls from 12 European countries.
[17] Women and poverty; **Education and Training of Women**; Women and Health; Violence Against Women; Women and Armed Conflict; **Women and the economy**; **Women in Power and Decision-making;** Institutional Mechanisms for the Advancement of Women; Human Rights of Women; **Women and the Media**; Women and the Environment; The Girl Child

women in ICT. When focusing on actions related to **Education and Training** it is important to consider the following indicators:

B1. Proportion of women and men graduates in tertiary (ISCED 5-8) and vocational (ISCED 3-4) education and training in the fields of science, technology, engineering and mathematics (STEM) and in the field of education, health and welfare (EHW) – of all graduates in the study field (2 indicators).

B2. Employment rate of women and men (aged between 25 and 39 years; and aged between 40 and 64) by highest level of education attained (1 indicator)

B3. Proportion of female and male academic staff differentiated by level of seniority and in total (1 indicator).

More recently, The European Institute for Gender Equality pointed the following gender- related challenges in European education systems: school, success and gender differences; gender and curriculum; teachers' training for gender equality; women in higher education, career choices and segregation; feminization in the teaching profession; the non-valued role of non-formal education to promote gender equality in school.

Does encouraging girls in using technologies will increase their will go to tech fields? Is the gender gap in tech a matter of skills? Is the problem in having or not digital and ICT competences? Eduarda Ferreira, in her article on the Project Gender@ICT considers that "gendered identities of young individuals have an effect on future educational and career choices, particularly in relation to science and technology" (Ferreira, 2017).

Although Portugal was not one of the selected countries in the Microsoft survey, aiming to understand why girls lose interest, the results were clear in showing the factors that may influence girls in what concerns STEM: more exposure to role models, more exposure to practical experience, also by "showing girls and young women how STEM knowledge is applicable outside the classroom" (Microsoft, 2018: 4). This may be done by introducing innovative teaching methods focused on practical applications of technologies" (European Commission, 2018: 140). Having teachers talking about those fields, being sure about the relevance of those fields, about equal employment opportunities in those fields and being creative (Microsoft, 2017) are very much needed. Therefore, career paths need to be transparent and young people needs to understand which the available opportunities are and to what some choices may lead. The same survey pointed that there is a window between 11 and 15 years old. By the age of 15 they lose interest. This means that we need to get to girls before higher education choices.

The Pilot Project *Engineers for 1 Day* aims to promote the mentorship between Higher Education female students in STEM and secondary education students. This programme is "promoted by the Portuguese Government, during the school year of 2017-2018, and developed by 10 school clusters. It focuses mainly on students attending the last 3 years of secondary (15-17 years old) and has been coordinated by the Commission for Citizenship and Gender Equality, with the Instituto Superior Técnico, Lisbon. The project aims to combat sexual segregation of the labour market and to prevent it through formal education, especially in the areas of technology and engineering where the percentage of women remain very low".

It is important to say that responding to girls' preferences would increase gendered choices due to former socialization. Raising awareness among educators and students about cultural and social construction on gender and expectations according to gender needs to be done to avoid explanations based on nature (sexual identity). Therefore, School is one of the most relevant context to educate young people about the role of ICT in the society and how they may become engaged and participate.

4.2. Improve and change vocational guidance

The literature has been clear in advising that vocational guidance needs to take place **before adolescence**. After the age of 15 girls and boys already selected the choices for themselves.

Career and vocational counsellors training is very much necessary in order to encourage people, despite of gender, and allow them the possibility to consider all the opportunities. This needs to change not only in what concerns the career choices but also education pathways.

Those professionals when working inside schools have a strong influence in young people choices, being important to understand and work on their perception about IT careers. An out-dated vision about this type of career may have negative effects, especially among girls and their parents. To promote their contact with industry grounded information is important to raise awareness about the diverse professional possibilities in tech. To work with these professionals to encourage students regardless gender is very important.

The educational and professional pathways and careers need to be **more transparen**t. This needs to take place both in education and industry context and culture.

After school programmes developed to expose girls to tech activities are positive initiatives. A study run by Microsoft indicated that "Girls who participate in STEM clubs and activities outside of school are more likely to say they will pursue STEM subjects later in their education" (2018: 4) Local/regional networks involving schools, local authorities in digital platforms to make a between connection between school and industries.

4.3. Change in the Industry. Involve the Industry

To foster girls and women in ICT involve a necessary change in the tech organizations' culture, as it was understood by the commitment of 20 IT companies that during the Digital4Her signed a declaration committing to gender balanced work culture. The declaration insisted in 5 actions: promote an inclusive, open, female-friendly company culture; recruit and invest in diversity; give women in tech their voice and visibility; create leaders of the future; become an advocate of change[18].

Changing cultures of representation about ICT professions (antisocial, isolating, repetitive and machine-oriented) need the industry involved. As it was mentioned in the event Digital4Her, it is necessary to change the companies' cultures – *cultural mindshift*.

A study from the department of Psychology and the Institute for Learning & Brain Sciences, University of Washington, (Cheyran et al., 2015) indicates that diversifying stereotypes may be the solution to the less interest of girls in computer science and engineering. In fact, in the article "Cultural stereotypes as gatekeepers", the authors, referring to the American culture, consider that computer science and engineering are seen as "male-oriented fields that involve social isolation, an intense focus on machinery, and inborn brilliance" (2015: 1).

Along with these stereotypes, the academic stereotypes "serve as gatekeepers, driving girls away from certain fields and constraining their learning opportunities and career aspirations" (2015: 1). Stereotypes about girls performing badly in a given subject impact in their performance and prevent girls from considering and choosing tech fields. Accordingly with Cheyran and colleagues stereotypes about the culture and stereotypes about ability are influencing women and girls participation in tech. Stereotypes about the culture includes preconceived ideas about people, work and values: people working in tech are socially isolated, focused only in technology; the type of work in not collaborative; and is addressing only masculine interests. Stereotypes about ability consider that girls have less ability than boys (Cheyran et all, 2015).

Role models and mentorship programs have a positive impact. DigiGirlz[19] is a programme for middle and high school girls that give opportunities to girls to learn with Microsoft employees and to experiment tech. Another initiative in Europe by the same company is SciTechGirl and ModernMuse[20]. There is a need to provide young people with insiders' view about working in tech. Therefore it is necessary to give prospective students more information that allow them to make informed choices when

[18] A Declaration for Europe's Corporate Tech leaders to Achieve Gender Balance in Their Companies and Equal Opportunities for Their Human Capital. https://ec.europa.eu/digital-single-market/en/news/ceos-tech-companies-sign-declaration-committing-gender-balanced-work-culture

[19] https://www.microsoft.com/en-us/diversity/programs/digigirlz/default.aspx

[20] https://www.modernmuse.org/#/

they are projecting their future educational careers. Therefore, a close connection between universities and R&D units and the industry is of utmost importance is necessary.

This interaction between HEI and the industry is promoted in an international event named University-Industry Interaction[21] that takes place in different cities, having the 6th edition take place in London last June. This event brings together "managers, practitioners and researchers in the field of entrepreneurial universities, collaborative innovation and university-industry interaction". This is a type of event and environment that might be the context to call the attention about the necessity to increase the number of women in ICT[22].

In Portugal, the *Technovation* and, in the US, the *Business Plan Competition* are good examples of strategies to foster women entrepreneurship while and after attending Higher Education.

4.4. Foster transitions to jobs context, entrepreneurship and leadership

In order to promote technological innovation we need to facilitate investment, support female entrepreneurs, mentoring and sponsoring (Intel & Dalberb, 2016). The Women in the Digital Age study indicates several challenges for female entrepreneurs, as lack of role models, stereotypes, lack of business networks especially gender balances network; they perceive more difficulties in balancing family and work responsibilities. Moreover, financial designs are also different against men, seeking for less founding, asking family to help, lower loans, etc. Female businesses are less financed that male business.

Accordingly with The Strategic Engagement for Gender Equality (2016-2019) the intervention needs to consider increasing female labour-market participation and the equal economic independence of women and men, reducing the gender pay gap, earnings and pension gaps and, thus, fighting poverty among women, promoting equality between women and men in decision-making, among others (European Commission, 2017)

A programme concerned with the lack of women in ICT has more impact if enhancing the access and if providing the possibility for women to stay in those fields, promoting the career development and mentoring for leadership. A good practice has been developed by Synopsys *Women in Leadership Programme*, with Maria Petrosyan, as Program Lead. This is a successful initiative by Synopsys that foster inclusion and diversity and is currently being piloted in Europe since 2017. For this pilot 19 women with leadership potential were selected in EMEA region. The programme incudes peer coaching, individual learning tools and activities, among others.

Specifically, and taking into consideration the Portuguese context and late concern in regional development, seems relevant to invest in capacity building of women entrepreneurs in rural regions. The Spanish Programme *Digitalizadas*[23] is an example on how to create opportunities for women from rural regions by developing their digital competence and be part of a network. This is aligned with the one of the transversal lines[24] of the National Strategy for Equality and Non Discrimination (ENID): territorialization. This idea is also aligned with the specify aim 5b) of the Sustainable Development Aim with is to 5b) Increase the use of baseline technology, specifically ICT to promote women empowerment.

[21] https://www.university-industry.com/

[22] A remark about this event is that the scientific committee mirrors the reality in this field. From a total of 31 members, 25 are males. The practitioners committee 21 are males of a total of 26

[23] https://www.digitalizadas.org/

[24] The National Strategy for Equality and Non Discrimination (ENID) has 3 main transversal dimensions: interseccionality, territorialization and partnerships promotion.

V. ACTIONS

The action plan is organised into typologies of actions targeting different type of groups: female students, students in general, female entrepreneurs, teachers, parents and vocational councellors, industry employees, media professionals. Those typologies are addressing identified problems as argued before in this document and plan to involve different sectors of the wider society: schools and school system, the industry, civil society organisations; media sector and Higher Education institutions as well as R&D institutions. Finally, the nature of this plan implicates areas of influence of different government ministries, being the Ministry of Science, Technology and Higher Education the most important in this respect.

Important note: each typology of actions integrates several actions. These actions are examples of what can be done to address the main objective under each typology of actions. Some actions can be piloted very easily in a near future as contexts conditions and commitments are already positive and, at some extend, negotiated. A few actions may in some cases be included in several activities of INCoDe.2030 already in place as the Creative Communities for Digital Inclusion (Axis 1). Some actions need financing. The organisation in typologies and large scope actions allows a level of abstraction necessary to activate the financing procedures.

A. ACTIONS DO UNDERSTAND, MONITORING AND EVALUATE

Alignment with policies:
a) at EU level:
Council of Europe Gender Equality Strategy (2018) - Strategic Objective 6 – Achieve gender mainstreaming in all policies and measures
Problem *Insufficient steps are taken by stakeholders to mainstream gender equality in their work* to
Mitigation action: "Encourage and support gender equality related research and sex-disaggregated data collection in different policy areas" (Council of Europe Gender Equality Strategy, 2018: 50).

b) at National level
National Action Plan for equality between women and men (PNAIMH)
Axis 1. Integration of the equality between women and men dimension (E1)
Sustainable Development Aim 5 – Target 5.1, 5c
Strategic Aim 1: To guarantee governance that integrates Equality Between Women and Men in all actions and levels
Specific Aim 1.2.: To guarantee information, including statistic data, of quality, sex-disaggregated.

Action 1. Doing Research

There is little research on the topic of gender equality and tech/ICT in the Portuguese context. A quick search in RCCAP, Open Access Scientific Repositories of Portugal, through keywords search (gender, ICT, Portugal) in the last 20 years (1998-2018) come up with 1 book chapter (related with girls and boys using differently ICT); 2 articles related with Educating Girls for ICT; 1 master dissertation on gender stereotypes and inequality in ICT professional context.

Seems necessary to develop and support studies on gender and ICT under the intersectionality approach (Crenshaw, 1989; 1991) to critically analyse inequality among women belonging to groups in disadvantage. This theory allows the understanding about privilege and disadvantages in a population that belongs to different demographic categories. The growing awareness that gender equality needs to be understood from an intersectional perspective is also present in the Portuguese government National Strategy for Equality and Non Discrimination (2018).

In what concerns research, suggestions are to:

- Develop studies to understand the impact of labeling (men's job or women's job).

• Develop studies on self-perception of skills.
• Develop studies on gender participation in tech.
• Replicate Microsoft study in Portugal - Microsoft didn't surveyed Portugal in the research they developed in 2017 on *Why Europe's Girls aren't studying STEM*. To replicate this studies and refocusing on ICT and using mix methods as the original study would bring a new light to understand the Portuguese context and compare to other countries reality.

Action 2. Monitoring and evaluating

Without regular data collection several phenomena will not be visible and, therefore, will not be issued as a problem. Moreover, "the paucity of data makes it difficult, if not impossible, to make the case to policymakers for the inclusion of gender issues in ICT policies, plans, and strategies" (Hafkin; Huyer, 2008: 26).

Portugal already has in most areas, from education to employment, sex-disaggregated statistics. The Ministers Council Resolution nº 103/2013 defined the commitment to have all the statistical data collected disaggregated by sex, in order to have a better knowledge and understanding about men and women situation in a diversity of relevant fields. Moreover, EU member states participate in Eurostat ICT data collection. It is necessary to monitor changes and assess women' participation in tech.

To develop a database to makes visible women as experts and successful women in Tech. Example to be followed: FEMtech[25], FEMtech the Federal Ministry for Transport, Innovation and Technology (BMVIT) - Austria

Action 3. Developing contextualised and comparable indicators

Indicators need to be adjustable to country aims. Relevant indicators emerge from understanding the sensitive context key drivers that prevent girls from engaging in tech.

There are figures that are not accurate indicators of gender equality (most of ICT teachers are female is just one example). Inaccurate data is coming also from household ICT surveys, as in most cases the "presence of ICT in a household does not guarantee that women in the household have equal access to them" (Hafkin; Huyer, 2008: 29). When women are heads of households the access to the Internet decreases. This situation may be explained by the fact that these women have a lower income, lower digital skills and less interest in internet technologies (EIGE, 2016).

Components of the Régentic Gender Digital Divide Indicators (in Hafkin; Huyer, 2008: 31) are a good orientation. This type of indicators is relevant to understand how women are benefiting from ICT. The components are Decision Making and policy; Content; Skills and Connectivity. The following indicators are a proposal to be further developed and refined.

Policy level Indicators:
• Explicit reference to gender in ICT policy and regulation.
• Explicit reference to ICT gender gap in gender equality policies.
• Explicit reference to gender issues and ICT policies in ICT training.
• Number of civil society organizations addressing gender in ICT.

Performance Indicators related to digital related education
Objective: Increasing the number of women in ICT education field in HE.
Indicator 1. Number of women attaining ICT filed of education (regular, vocational and HE).
Indicator 2. Number of lower academic performers who become interested in studying ICT.

Performance Indicators related with digital labour market
Objective - Increasing the number of women ICT specialists in the industry.
Indicator 1. Number of female ICT specialists graduated and working in IT companies.

[25] https://www.femtech.at/en/femtechs-database-female-experts

Indicator 2. Number of women and men in the ICT-related professions (and in different job positions).
Indicator 3. Number of female ICT specialists in top management positions.
Indicator 4. Number of female funders of start-ups in tech fields.

Access and use of digital technologies
Indicator: Number of women with internet access.
Indicator: Number of women-headed households with access to internet.

Indicators to understand how digital technologies impact differently in men and women.

Objective 1. Increase the number of female tech users
Indicator 1. Female users as a % of total users.
Indicator 2. Female users as a % of females.
Indicator 3. Female users of smart phone, Internet and computers.
Indicator 4. Number of women using the Internet to sell goods.
Indicator 5. Number of women using the Internet to buy goods.
Indicator 6. Numbers of men and women using the same type of technology.

Objective 2. Increase the use of technology for business purpose
Indicator 1. Number of women in SMBs using social media for business purposes.

Development: INCoDE.2030; Government Ministries'

B. RAISING AWARENESS ACTIONS

Alignment with policies:
a) at EU level
Council of Europe Gender Equality Strategy 2018-2023.
Strategic objective 1:
Prevent and combat gender stereotypes and sexism
Review of existing standards and monitoring their implementation. - Awareness raising and information campaigns about successful policies and implementation of standards. - Identification and dissemination of good and promising practices.
Targeting relevant actors, including the private sector for awareness raising activities. - Promotion of relevant standards regarding gender stereotypes in the media and in education. - Identification and promotion of good practices regarding the media, ICTs and education policies.

b) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Strategic Aim 3.
To guarantee a education free of gender stereotypes
Specific Aim 3.1. To promote an education free of gender stereotypes, for girls and boys (Engenheiras por um dia está aqui)
Measure 3.1.3. Development of projects in partnership with the education system, to stimulate education practices that involve girls and boys in sex segregated professions, namely ICT.
Specific Aim 3.2. To promote collective and organisations dynamics that guarantees the experience of equality relationships among boys and girls in schools and other education contexts.
Measure 3.3.2. Development of actions with HE students associations and youth associations to promote equality between women and men.

General description: campaigns for raising awareness are mainly focused on unconscious biases (both in schools, families, and workplace) that are influencing decision making processes for choosing educational pathways and professional careers. These actions aim to counteract negative stereotypes. "Gender stereotypes and sexism are reinforced by the inadequate portrayal of women in media, by the negative role of Information Communication Technologies (ICTs) and by lack of action regarding education policies" (Council of Europe Gender Equality Strategy, 2018). The **Target groups are** young people, teachers, parents, industry, media.

Action 1. Raising awareness roadmap (schools)

Description. Following Bizdirect good practice in the Municipality of Viseu – a set of small workshops organised by the industry in schools' clusters – population, 2nd and 3rd cycle and secondary education. This includes hands-on experience in industry contexts and the involvement o HEI in order to expose boys and girls to the reality of working in tech.
Aim: Breaking Stereotypes
Coordination: Marisa Rodrigues (Bizdirect)
Pilot Context: Viseu
Expansion: Other Municipalities with Tech Industries.

Action 2. Raising Awareness Among Teachers

Description: Organization and development of a training course for teachers. The guide for schools developed by Microsoft may work as a good starting point: Microsoft programme for closing the STEM Gap and guide for schools: (https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE1YrtX).

Working on assumed gender differences in performance in a subject is important that teachers may have the role of "keeping girls' concerns low" (Master et al., 2014)[26] and encourage them to choose STEM and Tech career paths.
Organisation: DGE; ME; CIG; ANPRI; National Association of Schools' Deans.
Advisor: Microsoft

Action 3. Raising Awareness Among Parents

Description: workshops for parents inspired in what Sue Black (Digital Sill Expert) is doing and investing in educating mothers first (Tech mumHQ – ICT for mums – including small awards for mums.
Organisation: Parents' National Associations.

Action 4. Raising Awareness among young people – Mobile Van for Gender Equality in IT (Schools)

Description:
Mobile version: following the good practice (Equality Van) developed by the national Federation of Youth Associations (FNAJ) in previous campaigns for gender equalities (financed by CIG), the van is visited by students (8th, 9th grade) equipped with gender equality in Tech activities.
Target Group: 8th and 9th students
Organisation: FNAJ – National Federation of Youth Associations and Students Associations & The Comission of Coordination and Development of Alentejo Region.
Pilot Proposal: Alentejo Region
Expansion: other regions
Non mobile version: national level campaign to promote equality between men and women in tech, organised by Higher Education Students Associations and Secondary Education Students association. This may have different possibilities using social networks or organising small events at regional level.
Organization: FNAJ – National Federation of Youth Associations and Students Associations
Advisor: Commission for Gender Equality (CIG)

Action 5. Raising Awareness among young people – After School Community to Promote Girls in IT

Description: Integrated in the support system for communities developed by Porto Tech Hub this community will be develop to create an opportunity to regularly discuss obstacles and opportunities for girls to become engaged in tech education fields. This community has the main aim of work with young women on self-perception of tech skills.
Target group: secondary education female students and Higher Education Students
Pilot Context: Porto Tech Hub
Expansion: Braga, Coimbra and Lisbon
Organisation: Geek Girls and Cristina Ribeiro, Higher Education Students and IT professionals.

Action 6. Raising Awareness about Transitions from secondary education to tech professions and short professional educational pathways

Description: a small study with students attending first year tech courses (level 5 - ISCED) in 4 polytechnic institutes didn't have any female respondents, indicating that there are not much interest from girls in integrating this type of educational pathways. This action aim is to raise awareness about transitions from secondary education to tech professions and short professional educational pathways.

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[26] This study indicates that "Although female teachers in these studies were more effective than male teachers in minimizing girls' stereotype threat concerns, that does not mean that *all* female teachers will be better than *all* male teachers in addressing these concerns" (Master et al., 2014: 92).

Investing in motivating girls to become enrolled in TeSP (Higher Professional Technical Course) in ICT that have a high probability to become employed and have the possibility to continue to Higher Education. There is a great demand from the tech industry in Portugal for this type of specialists and attracting girls would help to overcome this situation.
Target Group: secondary education students (10th to 12 th grade); parents; local tech companies and HEI.
Pilot context: Barcelos
Expansion: Polytechnic Institutes of Leiria, Setúbal, Beja, Bragança, using previous networks with these contexts from a small project related to increasing the number of students in TeSP.
Organisation: Eva Oliveira and Polytechnic Institutes and Schools (professional schools and regular schools with professional courses).

Action 7. Raising awareness Game Jam – Programming for Inclusion
Description: 24 hours activity with programmers involving secondary education students. Programming to solve the Gender Gap in Tech.
Coordination: Geek Girls and Lucinda Santos (PhD student studying Serious Games)
Pilot: FPCE. University of Porto and Media Innovation Lab (U.Porto)
Expansion: Contexts in which Geek Girls are based and together with HEI.

Action 8. Raising Awareness Cisco Webinars
Description: webinars developed by CISCO available to schools and to address 9th grade students in schools clusters, involving CISCO partners in different regions.
Organisation: CISCO.

Action 9. Development of Guides for schools and adaptation of Girls who Code books[27]
Description: develop a guide to schools following the example of Microsoft "An action guide to help close the gender gap in STEM", that can easily be adapted to the Portuguese context at focused in tech. https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE1YrtX. Girls who Code Books are tools created in the US to challenge stereotypes and would be very positive to have them translated and ready to be used, namely by teachers and other professionals in education.

[27] https://girlswhocode.com/books/

C. ACTIONS TO PROMOTE GENDER EQUALITY CAREER GUIDANCE, CAREER AWARENESS AND PLANNING

Alignment with policies:
a) at EU level
Council of Europe Gender Equality Strategy 2018-2023.
Strategic objective 1:
Prevent and combat gender stereotypes and sexism

b) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Strategic Aim 2. To guarantee conditions for a full and egalitarian participation of women and men in the labour market.
Strategic Aim 3.
To guarantee a education free of gender stereotypes
Measure 2.1.5. Development of projects fighting gender segregation in recruitment and work conditions.
Specific Aim 3.2. To promote collective and organisations dynamics that guarantees the experience of equality relationships among boys and girls in schools and other education contexts.

General description: these actions aim to discuss the situation of vocational guidance in schools and to understand practices that are reproducing stereotypes. The involvement of Psychology Departments of Higher Education Institutions aims to design possibilities to integrate gender awareness to overcome unconscious bias. The involvement of the industry is necessary to provide direct information about working in IT.

Action 1. Workshops/training for vocational and career counsellors

Description: connection between companies and career and vocational advisors from schools in order to provide young people with workplace grounded information enabling the exploration of a diversity of career and educational pathways. Workshops/webinars are to promote their contact with industry grounded information.
Involvement of organisations as Landing.jobs is important also to have a picture of the job sickers they have and how are they recruiting. Studies also indicate that the recruitment toolkits need to be redesigned (Intel & Dalbertg, 2016) in order to include gender sensitivity procedures.
Contexts: National level
Target group: vocational and career advisors from schools
Organisation: Order of Psychologists, Cristina Quadros

Action 2. Seminar with Higher Education Psychology Departments

Description: to create an opportunities to discuss about the necessity to train psychologists for vocational guidance in schools taking into consideration issues related to gender bias and to training and future educational and employment of girls and women in IT pathways.
Target group: HE Psychology departments
Contexts: national HEI
Organisation: Order of Psychologists, Cristina Quadros

D. ACTIONS TO PROMOTE WOMEN CAREERS IN TECH, ENTREPRENEURSHIP AND LEADERSHIP

Alignment with policies:
a) at national level
National Action Plan for equality between women and men (PNAIMH)

b) at National level
National Action Plan for equality between women and men (PNAIMH)
Strategic Aim 2. To guarantee conditions for a full and egalitarian participation of women and men in the labour market.
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a, 5c)
Specific Aim 2.1. Fight sex segregation in professions
Measure 2.1.3. Development of information initiatives and training.
Measure 2.1.4. Creation of incentives for entities promoting investment projects and start up accelerators to create measures to promote women entrepreneurship.
Measure 2.1.5. Development of projects fighting gender segregation in recruitment and work conditions.
Specific Aim 2.4. To promote a balanced representation in decision-making
Measure 2.4.2. Reinforcement of women entrepreneurs coaching and mentoring.

General description: the following actions are more directly to promote women careers, entrepreneurship and leadership. It is known, as mentioned, that we loose women from HE when doing the transition to the labour market and if they are specialists working in IT they have obstacles in progressing. Developing initiatives and provide opportunities for mentoring for career planning and entrepreneurship is very important as there are just a few support networks.

Action 1. Women Leadership Community

Description: Integrated in the support system for communities developed by Porto Tech Hub this community will be develop to create an opportunity to regularly discuss obstacles and opportunities for girls to become engaged in tech education fields. This community has the main aim of work on career development for women working in IT companies.
Target group: women working in IT companies.
Pilot Context: Porto Tech Hub
Expansion: Braga, Coimbra and Lisbon
Organisation: Geek Girls

Action 2. Pitching sessions and business plan competition for women IT business owners

Description: Promote women as tech starters and women as tech leaders by organizing a Business model; action plan; competitors; market size, potential to expand, etc.
Target group: women IT business owners
Pilot: Algarve
Expansion: these sessions may be organised in different parts of the country involving female entrepreneurs in IT industry.
Organization: Amélia Santos, INNUOS - Algarve

Action 3. Tech for solving problems - Business Plan competition for female Higher Education Students

Description: following a similar programme from Carnegie Mellon University (business plan competition) and the Technovation Challenge, a global initiative to promote tech entrepreneurship.
Target group: female students enrolled in HE IT fields
Pilot context: Lisbon and Porto
Expansion: Other national level HEI.
Organisation: Armanda Rodrigues, Faculty of Sciences and Technology of the Universidade Nova de Lisboa & Geek Girls, Faculty of Engineering of U.Porto.

Action 4. One-week boot camp for female start-up owners

Description: female entrepreneur have the opportunity to build up tech business models (action plan; competitors; market size, potential to expand). The boot camp may includes the opportunity for testing products; access to marketing training; legal and financial courses; human resources and recruitment and networking capacity building. A **Good practice to follow is** Circular board accelerator programme, funded by Carolyn Rodz, Texas to promote women business owners and DigiGirls.
Target group: female start-up owners
Pilot Context: Aveiro
Organization: Susana Sargento, University of Aveiro

Action 5: Campaign to motivate women entrepreneurs in ICT to sign up to European Network for women in Digital and to the Innovation Radar.

Description: in the context of the event Digital4Her in Brussels several keynotes raise participants awareness to the needs of providing more visibility to women in IT. One of the aspects was to motivate women in IT to sign up to different networks at EU level.
Organisation: Ministry Science of Technology, and Higher Education & Foundation for Science and Technology.

E. ACTIONS TO ENHANCE WOMEN CAREERS AND ENTREPRENEUSHIP BY DEVELOPING DIGITAL COMPETENCES

Alignment with policies:
a) at national level
National Action Plan for equality between women and men (PNAIMH)
Strategic Aim 4. Integrate the perspective of equality between women and men in HE and scientific and technologic development
Specific Aim 4.1. To integrate equality between women and men in scientific and technological production
Measure 4.1.4. Development of actions to the promotion of digital competencies of women and girls under the Portugal INCoDe.2030, namely under the action of Axis 1 (Inclusion)

General description: these actions aims to create opportunities for women to increase their digital competences and to open more possibilities to become employed or to start or develop their own business.

Action 1. Developing the digital capacity and competence of unemployed women

Description: Short duration training courses (up to 20 hours) adjusted to levels of competencies to addressed unemployed Women with a HE degree to increase their skills and digital competence and to contribute to their employability. The involvement of former students enrolled in qualification training processes will also work as role models. A **Good practice to follow is the** Serbian project IT Girls, included in the national Strategy for IT Industry Development.
Target group: unemployed women
Pilot: with former students of SWitCH initiatives
Expansion: to contexts where exists similar programmes.
Organisation: former students enrolled in IT qualification initiatives similar to SWitCH (Axis 3 of the Initiative INCoDe2030), Qualifica IT (Braga) or Mudar O Rumo (Coimbra).

Action 2. Promoting Digital Competences for Entrepreneurship for women in rural regions

Description: Workshops for women entrepreneurs to develop digital competences. During the development of other INCoDe2030 initiatives in rural regions of Portugal we became acquainted with the situation that many women with small business related with craftsmanship, rural products and patrimony are lacking digital skills. Developing conditions for these women to develop their digital competence would benefit them give more possibility to overcome different types of inequalities. Promoting Digital Competences for Entrepreneurship - Historical Villages Networks, involving regional companies and IHE.
Target group: women entrepreneurs from rural regions
Pilot proposal: Historical Villages Network + ALTRAN + IPGuarda+UBI
Expansion: other existent villages network in the central region of Portugal.
Organisation: Historical Villages Network
Advisor: Maria João Botelho - LEARD (mariajoaobotelho@gmail.com), still to be contacted.

F. ACTIONS WITH MEDIA AND ACTIONS TO CHANGE THE MEDIA

Alignment with policies:
a) at EU level
Council of Europe Gender Equality Strategy 2018-2023.
Strategic objective 1:
Prevent and combat gender stereotypes and sexism
Review of existing standards and monitoring their implementation.
Targeting relevant actors, including the private sector for awareness raising activities. - Promotion of relevant standards regarding gender stereotypes in the media and in education. - Identification and promotion of good practices regarding the media, ICTs and education policies.

b) at national level
National Action Plan for equality between women and men (PNAIMH)
National Action Plan for equality between women and men (PNAIMH)
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Strategic Aim 3.
To guarantee a education free of gender stereotypes

General description: This set of actions has two main aims. The first is related to work on how media (journalism in particular) have been picturing gender issues and women, reproducing stereotypes even when the aim is the opposite. Therefore, media needs to change in order to promote women visibility in academia, in knowledge production and science as well as the visibility of women in leadership positions. The second is to work on gender and IT contents that may disseminated through media channels.

Action 1. Media education campaign

Description: Change the stereotypes; change the media and the audiovisual. This action would be to raise the awareness among journalists and other media professionals to gender stereotypes.
Anabela Mota Ribeiro, portuguese jornalist is avaliable to become involved.

Action 2. Video aiming to promote a balanced picture of women in tech

Description: This video may include good practices at national level, successful histories, showing decision-making processes, etc. The video would be available for TV Channels and social networks and websites.

Action 3. Inspiring short videos on Girls and women in IT

Description: **Following Microsoft Videos or Modern Muse programme focused on obstacles. A good example to follow might be the UK video on *What's it like to be a female entrepreneur in the digital tech sector*?**[28]

Videos may showcase: Different paths in TECH; Advices to girls who are interested in tech; How ICT is creative? How teachers, parents, communities may help and make a difference.

Action 4. Development of a National Brand accounting this initiative on Gender Equality in IT

Description: The development of a brand would allow a more effective promotion and dissemination of the initiative aiming to target different contexts and groups of population.

Organisation: Communication office of the INCoDE.2030

G. ACTIONS FOR THE INDUSTRY

Alignment with policies:
a) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Strategic Aim 2. To guarantee conditions for a full and egalitarian participation of women and men in the labour market.
Specific Aim 2.1. Fight sex segregation in professions
Measure 2.1.5. Development of projects fighting gender segregation in recruitment and work conditions.

General description: the industry needs to be involved in the whole programme, not only because it is necessary for the mentoring programme, for role models, but also because the IT industry also needs to develop equality and diversity policies and be committed with transparency and support.

Action 1. Elaboration of a Charter

Description: This charter would be signed by tech companies (similar to the Tech Talent Charter in the UK, "commitment by organisations to a set of undertakings that aim to deliver greater diversity in the tech workforce of the UK, one that better reflects the make-up of the population"[29]. Companies commitment towards inclusion needs to be visible in their mission and values.
Organisation: Ministry level

Action 2. Equality Workshops for the IT Industry

Description: following the initiative of CITE – Commission for Equality in Work and Employment, 2017) to stimulate companies to develop the action plans to fight segregation and gender inequality.
Target group: IT industry employers
Organisation: CIE and CIG (?)

Action 3. Award companies, which integrate or develop gender equality measures or initiatives.

Description: these awards are contemplated in the AWARDS & RECOGNITION part.

[28] https://www.youtube.com/watch?v=O7l9DrFMsmI
[29] https://techtalentcharter.co.uk/

H. TRANVERSAL ACTION: THE MENTORING PROGRAMME

Alignment with policies:
a) at EU level
Council of Europe Gender Equality Strategy 2018-2023.
Strategic objective 1:
Prevent and combat gender stereotypes and sexism
Strategic Objective 6 – Achieve gender mainstreaming in all policies and measures
b) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 1. Integration of the equality between women and men dimension (E1)
Sustainable Development Aim 5 – Target 5.1, 5c
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Axis 3. Egalitarian, inclusive and future oriented scientific and technological development
Sustainable Development Aim 5 – Target 5.1, 5b,5c)

General description:
The study by Microsoft (2017) indicated that there is "a narrow four year window of opportunity to foster girls' passion in STEM subjects in Europe" (Microsoft, 2017: 2). Mentoring programmes organised in different scales and levels may work as an important strategy as some successful initiatives seem to indicate. Initiatives as Technovation Challenge, IT for SHE and the WeHubs - Women Web Entrepreneurs Hubs[30] are some examples of good practices in motivating girls and women for STEM and ICT in particular. European reports also acknowledge the importance of mentoring (European Comission, 2018) to fight the stereotypes and showing female students as experts. The mentoring programme will have some similarities with the IT for SHE programme developed by the Fundacja Edukacyjna Perspektywy http://www.itforshe.pl/pl/. Its coordinators accepted to become advisors.
3 levels of mentorship:
1. Mentor from a Company mentor a early career professional for career development and leadership;
2. Mentor from a Company mentor a HE student.
3. Exposure actions

Development of a Platform
Digital platform to allocate Mentors and Mentees and foster mix pairing in the 3 levels of mentorship. May include mentors, parents, students, teachers sign up –signing by profile.
The Platform would be similar to Modern Muse: connecting generations. Young women may choose a mentor who shares knowledge; companies may register as well as women in tech to provide inspiration and students searching for information or wanting to help younger students. May include videos showing a variety of inspiring Tech workers and case studies. This platform allows the creation of a national network of companies willing to be a partner of this movement mentor girls (and boys).

Exposure actions
One important part of the mentoring programme are the **exposure actions**: real-world applications of tech computing knowledge; showing the impact of tech in the world; exposure to role models, tech jobs and career awareness and planning (Microsoft, 2018).
The exposure to different real world applications of ICT and STEM knowledge showing associated creativity and the possibility to have impact in the world. This actions aim to show girls how computer, ICT, digital knowledge may be used.

Igniting curiosity before 15 - Students from HE mentoring girls and boys in primary and secondary education before 15 years old.
Support and inspiration may be found in pedagogic materials as:

- Code Like A Mighty Girl: 25 Toys & Books To Inspire Mighty Girl Coders at https://www.amightygirl.com/blog?p=16049;

[30] http://wehubs.eu/summary/

- Grace Hopper: Queen of Computer Code at https://www.amightygirl.com/hopper-queen-of-code;
- Ada Byron Lovelace and the Thinking Machine"(https://www.amightygirl.com/ada-lovelace-thinking-machine).
- "Ada's Ideas" (https://www.amightygirl.com/ada-s-ideas);
- 60 Books to Inspire Science-Loving Mighty Girls, athttps://www.amightygirl.com/blog?p=13914

Bootcamp – teaching Tech impact in the world
Description: to teach how technology works and how the population in general, and female population, in particular may become active users and creators and not only consumers.
Similar to Iwhish initiative in Ireland involving HE institutions, showcasing the many opportunities for women in tech. exhibitors from both industry and academia, and female role models. Local industries and HEI develop and host a 5-day interactive ICT Campus Week for 9 grade students.
The aim is to change cultural atitudes towards tech among students, secondary education teachers and families. I Wish Campus Week" in Cork shows has evidence "that the campus week has a big impact on the students, with 89% considering a STEM career as a result of the week" (information sent by programme coordinators).
IWish model: 100 girls, 5 days, 80 volunteers and includes: Interactive workshops; Industry site visits; role models presentations; Q&A presentations; Applied Tech experiences (Moloney, Welch, Loftus, 2018).

Industry advisors:
CISCO
Synopsys
Microsoft Portugal
Tech Hub

Organization:
Amélia Santos, INNUOS, Entrepreneurship
Cristina Ribeiro, Faculdade de Engenharia da Universidade do Porto, Mentoring and Raising Awareness
Palmira Silva, Instituto Superior Técnico, Mentoring
Helena Santos, Instituto Superior Técnico, Mentoring
Marisa Rodrigues, Mentoring, Raising Awareness
Susana Sargento, Universidade de Aveiro, Leadership and career development
Vânia Oliveira, Geek Girls, Mentoring and Raising awareness
Sofia Tenreiro, CEO, CISCO (to be confirmed), Mentoring and Leadership
Sofia Marques da Silva, INCoDE.2030 – Axis 1 Coordination

I. TRANVERSAL ACTION: PILOT – MUNICIPAL PLAN FOR GIRLS IN IT

Alignment with policies:
a) at EU level
Council of Europe Gender Equality Strategy 2018-2023.
Strategic objective 1:
Prevent and combat gender stereotypes and sexism
Strategic Objective 6 – Achieve gender mainstreaming in all policies and measures
b) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 1. Integration of the equality between women and men dimension (E1)
Sustainable Development Aim 5 – Target 5.1, 5c
Axis 2. Full participation of women and men in public and private sphere
Sustainable Development Aim 5 – Target 5.1, 5.4, 5.5, 5.6, 5a,5c)
Axis 3. Egalitarian, inclusive and future oriented scientific and technological development
Sustainable Development Aim 5 – Target 5.1, 5b,5c)

Municipal Plan for Girls in ICT: increasing the sense of belonging to tech and computer science filed

Description: Viseu municipality has a manifested interest in fostering the "Sense of belonging to the city and the region". This pilot towards the promoting of girls and young women in ICT is inspired in that objective. Tries to integrate some of the actions that are proposed but integrated in a Municipal Plan for Gender Equality in Tech. This idea of piloting an experience in Viseu was firstly proposed by the mayor and conversations with Bizdirect (tech company based in Viseu) were aligned with this proposal. Moreover, Bizdirect is already involved in raising awareness initiatives to motivate girls for ICT in schools. The Municipality has a Educational Plan and this pilot will integrate it.
Viseu Pilot will be a laboratory to experiment different actions proposed in the typologies of actions described above.
Target group: female students in Secondary Education and Higher Education.
Context: Viseu
Partners: City Hall of Viseu; Bizdirect (or Coopete with Critical Software; Softinsa and also IBM) and other local tech industries; the Polytechnic Institute of Viseu; IEFP of Viseu; Youth Associations of Viseu, namely the Cultural Association Adamastor (Hugo Ribeiro)
Plan

- Involve women in leadership from tech companies as role models
- Develop the concept of workshops roadmap (already developed by Bizdirect)
- Open day in the tech companies to foster the hand-on-experience approach
- Using Viseu's concept of Living Lab, Smart City and Summer School to create a Girls Academy (Code for good; Serious Games – Game Jam; contact with women in tech, women start up founders)
- Integrated in the Municipality Education Plan – Viseu Educa – to explore the existing project of entrepreneurship in secondary education schools focused on solving social problems through Tech (for boys and girls).

Organisation: Bizdirect, Softinsa; Polytechnic Institute of Viseu and the Municipality of Viseu

J. OTHER ACTIONS: AWARDS & RECOGNITION

Alignment with policies:
a) at national level
National Action Plan for equality between women and men (PNAIMH)
Axis 3. Egalitarian, inclusive and future oriented scientific and technological development
Sustainable Development Aim 5 – Target 5.1, 5b,5c)
Strategic Aim 4. Integrate the perspective of equality between women and men in HE and scientific and technologic development
Specific Aim 4.1. To integrate equality between women and men in scientific and technological production
Measure 4.1.4. Development of actions to the promotion of digital competencies of women and girls under the Portugal INCoDe.2030, namely under the action of Axis 1 (Inclusion)

1. INCoDe STAMP – Women Talent Welcome – companies/organisations who have or develop programme to promote gender leadership, career development or initiatives to motivate girls for ICT.

2. Ada Lovelace Awards
Categories:
Best app developed by female HE students
Best Young professionals in IT – up to 30yo
Best C-level leaders
Best Disruptive start-ups
Best Leading companies, networks of companies and other NGO promoting inclusion and gender equality in tech
Best project lead by a young women – Rising star
Best initiative to increase gender equality

3. Mentorship awards
Best leader mentor
Most influential mentor

L. OTHER ACTIONS: CONFERENCES AND WORKSHOPS

1. Multiplier events
National level workshops showcasing pilots to expand

2. International conference:
European programms and iniciatives - promising approaches
Proposal: to be included at the INCoDe.2030 Forum in 5th of December

3. Girls in ICT national conference

VI.
ADDITIONAL INFORMATION

6.1. European and worldwide programmes for comparison and to follow up

Europe/EMEA
Women in Leadership (SYNOPSYS) - Maria Petrosyan, SYNOPSYS, Sr. Manager/HR Business Partner Eastern Europe, TLD Lead EMEA and Ruzan Nalbandyan, Manager of the Women in Leadership Project.

Austria
FEMtech[31], FEMtech the Federal Ministry for Transport, Innovation and Technology (BMVIT)

Poland
IT for SHE
Bianca Siwinska, Joanna Lisiecka and Monika Biskupska (Founders) – IT for SHE, Poland
Additional grant (340 euros) for best students in IT
HE Institutions received additional funding for modernizing curriculum; creating jobs and collaborating with economy sector.

Ireland
I Wish' (Initiative for Women in STEM) (http://www.iwish.ie/ *Engineering* **Cork Institute of Technology**
National Women Strategy (ended in 2016).

Denmark
Digipipi, Mentoring Programme – contacted, external advisors
Gender certificate: Denmark

Sweden
Gender Equality Programme for Schools (started in 2008)
Gender Mainstreaming in Academia (ends 2019)

Germany
ROBERTA: Robotics for Girls Campain and the GO MINT (STEM)

France
Convention Interministérielle pour l'égaliteé entre les filles et les garços, les femmes et les homes dans le systemmes éducatif, 2013-2018.

Lithuania
National Programme on Equal Opportunities for Men and Women (2021)
State Education Stratagy (2022)

Croatia
National Policy for Gender Equality (ended 2015)

[31] https://www.femtech.at/en/femtechs-database-female-experts

USA
Carnegie Mellon University:
Summer Engineerig Experience for Girls (SEE); STEM STARS, Carnegie Mellon University: (US)
Click! Spy School (10-14), Carnegie Mellon University: (US)
Girls of Steel Robotics,
Business Plan Competition

6.2. Start-up Accelerators to involve in the future

Incubadora de Empresas da Universidade de Aveiro (IEUA)
Madan Parque
Startup Lisboa
IPN Incubadora
OPEN
Ninhos ANJE
Incubadora D. Dinis
In.cubo
Sanjotec
Inova Gaia
DNA Cascais
AITEC Empresário Digital
CACE
Rede de Incubadoras de Empresas da Região Centro (RIERC)
Instituto Empresarial do Minho
Centro de Incubação e Desenvolvimento Lispolis
PROMONET – Associação Promotora de Novas Empresas e Tecnologias
Universidade de Trás-os-Montes e Alto Douro – GAIVA
Avepark
Biocant
FeiraPark
Iparque
IPN – Instituto Pedro Nunes
Madeira Tecnopólo
Parkubis
ParquInvest
PortusPark
TecParques
TagusPark
UPTEC
Incubadoras Lisboa

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