ladies.in.tech

GIRLS IN TECH

A CALL TO ACTION FOR THE INDUSTRY, POLICYMAKERS & EDUCATORS

CONTENT

DEAR READERS,

During these turbulent times, the importance of tech has become far more tangible for the whole of society. There has, however, not only been a boom in digitalization itself; there has also been an upsurge in society's acknowledgement of just how important it is to have more women in the tech field – and to buoyantly raise girls' aspirations for tech-based careers.

There are multiple reasons for this: As digitalization escalates, companies are frantically seeking more skilled tech workers – with the greatest untapped pool of talent being that of women and girls. But the need for more women in tech is about so much more than just filling skills gaps. In order to have the tech world gain different insights and viewpoints and to master challenges, we need all of the talents that both women and men can bring to the workplace. The call for more girls and women in tech is therefore becoming louder and louder.

Here we have to take on board just how far we need to go to fully access the pool of female talents. Across the globe, just one in four tech specialists are women, while in the EU, this drops to less than one in five. When it comes to girls themselves, the level of interest in pursuing a future tech career is three times lower than it is among boys. This is rather sobering: If girls' interest in tech does not rise, then the whole of society will be affected in both the short and the long term.

As such, it is not only the IT & tech industry, but also society itself that needs to get to grips with the issues holding girls back in the tech field. Ultimately, what is required is systemic and coordinated change, and not just a set of disparate initiatives. For this reason, as a core project for "International Girls in ICT Day 2022," we have prepared this white paper to highlight not only what employers in digital technology can do to help tackle the gender equality challenge, but also what other stakeholders – particularly policymakers, educators, and parents – need to take on. Digital education has a key role to play in this process, with the groundwork needing to start at a very early age, at home and in schools. These are where expectations are forged, and competencies are cultivated.

As Europe's largest Internet association, eco has been actively campaigning for many years on the topic of diversity and recognizes just how crucial it is to turn the tide for girls in tech. eco's #LiT – Ladies in Tech initiative is growing on a day-to-day basis and involves a large spectrum of our member companies and our association partners. As part of this spectrum: a shout out to 15 role models from tech companies and associations in Europe, the U.S., and Africa, who have worked hand-in-hand with us in carving out this white paper.

No matter what country you are in, and whether you are a tech company, a policymaker, an educator, a parent, a girl or a boy: this white paper is intended to help shift the dial in favor of gender equality. If you take action, you'll be stacking the deck in favor of society and the economy as a whole.

On behalf of the eco Association, we wish you an exciting, insightful, and inspiring read!

With kind regards

Oliver Süme
Chair of the Board,
eco Association

Lucia Falkenberg
Chief People Officer,
eco Association

EXECUTIVE SUMMARY

Decades of research findings show that diversity of thought leads to better problem-solving and innovation. However, increased innovation and market reach are not the end of the economic story: what is critically at stake in current times is an ever-widening skills gap in the IT & tech market. In reviewing this market, what is particularly clear is that the greatest untapped pool of talent is that of women and girls. But unfortunately, in spite of the indisputable need to have far more women involved in IT & tech careers, the gender imbalance in the industry still remains far more stagnant than mobile. In this regard, a central issue to recognize is that gender imbalance in the tech field does not just suddenly surface at a time when young women start their careers. Rather, career expectations are molded at a very early stage in life and become further entrenched as girls grow up.

A clear cognizance of this issue has led to this white paper being generated by the eco Association and released on the occasion of International Girls in ICT Day 2022. The core aim of the white paper is two-fold:

- To offer companies, policymakers & educators an insight into both the realities and causes of what is blocking the girls' pipeline into the IT and tech industry;
- To offer companies, policymakers & educators a concrete set of recommendations for unblocking the pipeline for girls in tech.

CONTENT OF THE WHITE PAPER

The paper is founded not just on secondary research into first-rate studies, but also on first-hand insights from 15 role models from IT & tech companies and associations in Europe, the US, and Africa. Arising from this research and insights, the paper is structured as follows:

- Section 1 starts by adopting a broad lens in providing facts & figures on both "Women in Tech" and "Girls in Tech" across the globe;
- Section 2 drills down on six core causes of the gender imbalance in the IT & tech industry;
- Section 3 provides five recommendations for action for IT & tech companies;
- Section 4 sets out six guidelines for policymakers and educators.

FIVE FACTS & FIGURES

Multiple facts & figures are provided throughout the paper, with the following five statistics presenting just a quick snapshot of the degree of the industry's gender imbalance.

1. Just 26.2% of tech professionals in the U.S. are women.
2. In the EU, this is even lower: on average, only 18.5% of tech professionals in Europe are women.
3. Across 39 OECD member countries, just 20% of computer science tertiary graduates are female.
4. In the U.S., nearly three times as many male students (33%) compared to female students (12%) express interest in pursuing a tech career in the future.
5. Across OECD countries, by the time teenagers have reached 15 years of age, a startling ten times more boys than girls would like to become tech professionals.

SIX CORE CAUSES OF THE GENDER IMBALANCE

The core roots of the gender imbalance in the IT & tech industry are identified within the paper: together, these form part of what can be seen as a "vicious circle". The causes are summarized below:

1. Stereotypes in education & upbringing, with an imbalance in tech skills and aspirations starting to take shape in childhood.
2. Too few female role models & leaders, with this serving to reinforce these stereotypes.
3. Demotivation for tech careers in high-income countries, with girls displaying lower levels of confidence than boys in these regions.
4. Wider digital gender gap in lower-income countries, with girls in these regions far more likely to be offline than boys.
5. A bro-culture associated with teams comprising of a majority of men, which can have a particularly alienating effect on women.
6. A media & marketing culture which repeatedly presents technology as being a boy's club, triggering a chain reaction.

Overall, the problem of gender imbalance is too deep and multifaceted to address with singular actions – no matter how ambitious these might be. Tackling the gender gap from the earliest ages onwards is clearly a task for the whole of society and requires an ecosystem of actors and actions. The paper therefore presents a set of recommendations for IT & tech companies, as well as guidelines for policymakers & educators.

FIVE RECOMMENDATIONS FOR IT & TECH COMPANIES

1. Role models: Companies must enhance the visibility of female specialists and leaders.
2. Diversity corporate culture: Companies should themselves become role model companies through developing a corporate culture characterized by diversity.
3. Networking and mentoring: As part of the culture of diversity, companies should create space for networking and mentoring formats, with a key focus on women in leadership.
4. Collaboration with educators: Where possible, companies can ideally become trailblazers in collaborative development with schools, universities, NGOs, or training companies.
5. Employer branding: Companies should take a new approach to employer branding and recruiting, targeting female applicants.

SIX GUIDELINES FOR POLICYMAKERS AND EDUCATORS

1. Embed digital competence in kindergartens & mainstream schools.
2. Introduce and support parenting IT & tech initiatives.
3. Embed digital competence in higher education.
4. Promote and support ICT training & e-learning courses.
5. Integrate mentoring into all digital education spheres.
6. Develop and support out-of-school programs, clubs, and camps.

1. THE CRUX OF THE MATTER

There is no single digital economy in the world for whom the promotion of gender equality does not make sense. Decades of research findings show that diversity of thought leads to better problem-solving and innovation. From an economic perspective, the bottom line is that having more women working in IT & tech companies will enhance the industry's competitiveness and increase revenues. All in all, as a Deloitte study confirms, inclusive organizations are 1.7 times more likely to be innovation leaders in their market.

But increased innovation and market reach aren't the end of the economic story. Despite the impact of the Covid-19 pandemic on global unemployment, there are already signs of a much tighter labor market in most countries. As locked-down industries open up, specific skills demands and rising competition have companies around the globe facing more challenges than ever in attracting and retaining skilled workers. In 2021, nearly 7 in 10 (69%) companies internationally reported talent shortages and difficulty hiring, with this representing a 15-year high.

With the increased application of digital technologies into a broad range of economic sectors such as healthcare, manufacturing, energy, retail, transport, finance and education – not to mention the tech sector itself – the vast majority of jobs in the near future will require digital technology skills. Particularly since the start of the pandemic, a rapid surge in the demand for tech specialists has erupted. While the tech industry may have the strongest outlook of all sectors, it is also presented with the greatest challenge with regard to accessing the relevant professionals, with this confirmed in three facts & figures below.

TABLE 1: ICT SKILLS GAPS – FACTS & FIGURES

In the EU, 55% of enterprises in 2020 reported difficulties in recruiting ICT specialists. This lack of employees with advanced digital skills is identified as a contributing factor towards the slower digital transformation of businesses in many EU Member States. EU Commission Digital Economy and Society Index, November 2021

In 2021, IT and data specialists ranked first in Germany and fourth across the globe among the top seven jobs that employers were having difficulty filling. ManpowerGroup Employment Outlook Survey, December 2021

In the U.S., talent shortfalls in the key occupations of computer and mathematics are set to soar from 571,000 in 2020 to 6.1 million by 2030. Germany is also projected to have a shortfall of 1.1 million by 2030. Boston Consulting Group, The Future of Jobs in the Era of AI, March 2021

These talent shortfalls are having a serious impact on companies in the Internet industry. But it's not just employers that are being affected – complete societies and economies are also at the receiving end. Governments themselves are becoming increasingly concerned by digital skills shortages, which can result, among other disadvantages, in less innovation, lower levels of productivity, slower overall economic growth – and, crucially in these globally troubled times, a deficit in areas such as cybersecurity skills.

Across the globe, there is therefore an urgent need for more talent in order to address this ever-widening skills gap, with employers, policymakers, and society as

a whole needing to get to grips with this situation. So, what is the crux of this matter? **Without a doubt, the greatest untapped pool of talent is that of women and girls**. As digitalization increasingly permeates all sectors of the labor market, if this pool is not accessed, the shortage of tech specialists is forecast to grow steadily and to impact all industries. In order to block this impasse, there is an acute need to focus on girls in tech – and to build the gender pipeline from the bottom up.

WHO IS THIS WHITE PAPER FOR?

Across Europe and the globe, eco – Association of the Internet Industry is accompanying the substantial efforts being made by numerous member companies to move closer to gender parity. In their endeavors, these companies recognize that such parity will not come about just by chance and are looking both inwards and outwards to seek optimal solutions. For all companies, one factor is blatantly clear: Gender imbalance in the tech field does not just suddenly surface at a time when young women start their careers. Rather, its backdrop is in how career expectations are molded at a very early stage in life and become further "straitjacketed" as girls grow up.

This is where learning between countries can offer invaluable insights: both into what actions can work for raising girls' interest in tech, and into how to tackle factors that might be more resistant to change. This white paper extracts and shares such learning with a view to not just supporting the Internet industry, but also society in general. The aim of the white paper is thus two-fold:

- To offer companies, policymakers & educators an insight into both the realities and causes of what is blocking the girls' pipeline into the IT & tech industry; and
- To offer companies, policymakers & educators a concrete set of recommendations for unblocking the pipeline for girls in tech.

CONTENT OF THE WHITE PAPER

The preparation of this white paper forms just one part of an ongoing eco Association campaign for gender equality in the tech industry. In Germany, our eco initiative #LiT – Ladies in Tech offers myriad actions, such as an interview series for women in tech, a speakers' directory, and a series of regular webinars. Arising from such actions, the boosting of role model visibility is naturally of strong relevance for girls in tech. In addition, in 2020 eco published an international study on Women in Tech Across the Globe, followed by a 2021 white paper on Women in Tech in Germany.

The content informing this white paper is drawn from both secondary research and first-hand experience from eco Association partners and member companies from around the globe. Arising from this research, the paper is structured as follows:

- **Section 1** starts by adopting a broad lens in providing facts & figures on both "Women in Tech" and "Girls in Tech" across the globe;
- **Section 2** drills down on six core causes of the gender gap in the IT & tech industry;
- **Section 3** provides five recommendations for action for tech companies;
- **Section 4** sets out six guidelines and associated recommended actions for policymakers and educators.

SHIFTING THE DIAL FOR GIRLS IN TECH

"Being a technologist allows us to be part of the progress in innovative tech solutions which are part of the digital transformation taking place in the economy and society! It is not only about the engineering and the technology itself but also about what we can do with it, about helping build our World as we want it to be."

Maria Barros Weiss, VP of Digital Ecosystems Solutions at IONOS

2. FACTS & FIGURES

Ultimately, no country is yet coming close to the 50-50 gender balance which the world has been striving to achieve by 2030 (see UN Women, 2017). On the contrary: while the trend for women's employment in the tech industry may be fluctuating slightly, in the last decade it has been veering in the wrong direction. The 15 facts & figures set out in Table 2 below highlight just how skewed this gender imbalance in the tech field is.

TABLE 2: ICT SKILLS GAPS – FACTS & FIGURES

1. In the EU, the latest figures show that just 18.5% of tech professionals in the EU are women, constituting just a minor rise of 0.6% from pre-pandemic times. Eurostat, 2021

2. The percentage of women in the EU tech sector has dropped in the past decade, from 22.5% in 2010 to the current 18.5%. Eurostat, 2021

3. Looked at from a more positive angle: there is a small cluster of countries in the EU where more than 25% of tech professionals are women, with these including Bulgaria, Greece, Romania, and Serbia. Eurostat, 2021

4. However, as **Figures 1 & 2** highlight, there is a significantly larger batch of EU countries – for example, Germany, Italy, and the Netherlands – where less than one in five of all tech professionals are women. Countries with exceptionally low numbers include the Czech Republic, Hungary, and Poland. Eurostat, 2021

5. On a broader worldwide level, the most recent OECD statistics from G20 countries indicate that men are on average four times more likely than women to be ICT specialists in these countries. OECD, 2018 [1]

6. Globally, women account for 14% of the cybersecurity workforce in the U.S., 10% in the Asia-Pacific region, 9% in Africa, 8% in Latin America, 7% in Europe, and 5% in the Middle East. Global Information Security Workforce study, 2018

7. In the U.S., just over one-quarter (26.2%) of tech professionals are women. US Bureau of Labor Statistics, 2021

8. The percentage of women in the U.S. tech sector has dropped significantly in the past decades, from 36% in 1991 to the current 26.2%. National Center for Women & Information Technology

9. The software development field, despite its growing influence in day-to-day life, appears to be particularly devoid of women. For example, in cloud computing, women make up just 14% of the global workforce. World Economic Forum, 2021

[1] While more recent statistics are available from the EU and the U.S., the majority of available global figures are from 2018.

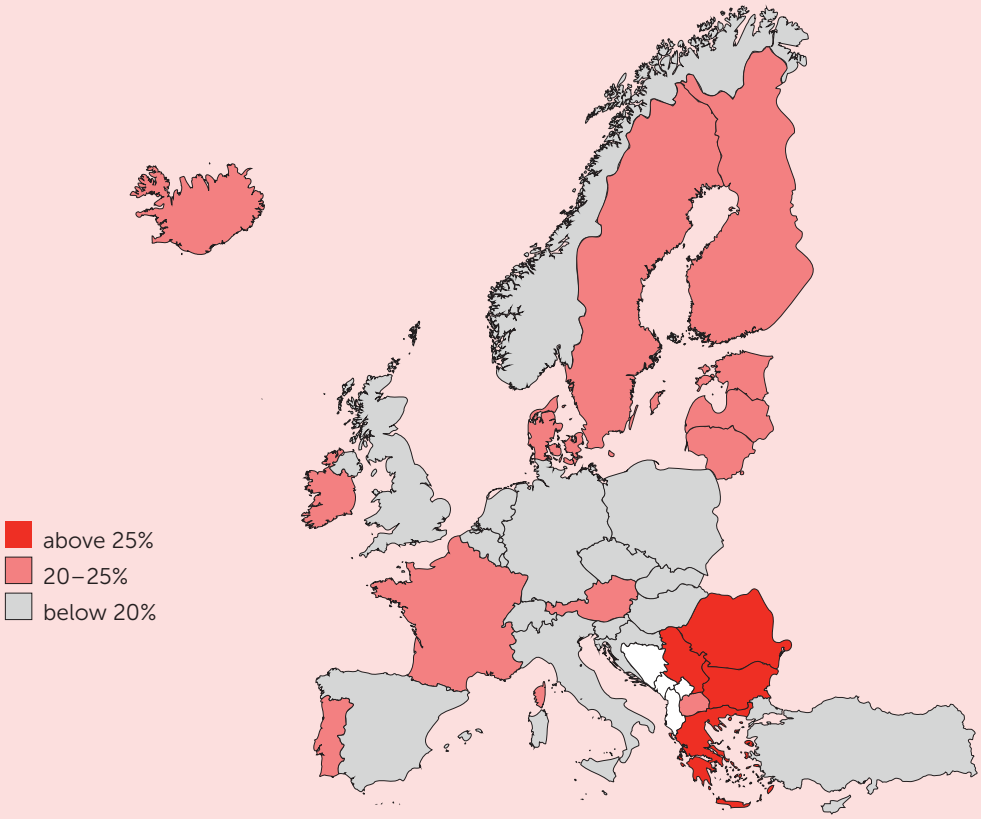


Fig. 1: UK and EU Countries Above or Below 25% Women in Tech

10. By the time women in tech reach 35 years of age, 50% are leaving the industry for good, which is significantly higher than the cross-industry average, which is approximately 20%. Accenture, 2020

11. Within the overall Internet industry, there is a stark absence of women in leadership roles: Across the globe, women account for just 3.2% of CEOs in IT companies. Fortune, 2019

12. Just 19.2% of directors in the IT & tech industry are women, making it one of the most lagging of all industrial sectors. MSCI Index, 2020

13. In the UK, only 9% of senior leadership roles in tech are held by women. Frank Recruitment Group, 2021

14. Women are involved in only 15.7% of startups with an innovative business model. Female Founders Monitor, 2020

15. As one study shows, 54% of women say that the pandemic has made it harder for them to break into the tech industry. A survey of 177 women working in tech companies found that more than half (57%) felt that the pandemic had led to a regression of gender roles, with a third of these (34%) believing they had been set back by as many as ten to 20 years. Tech Republic, 2021

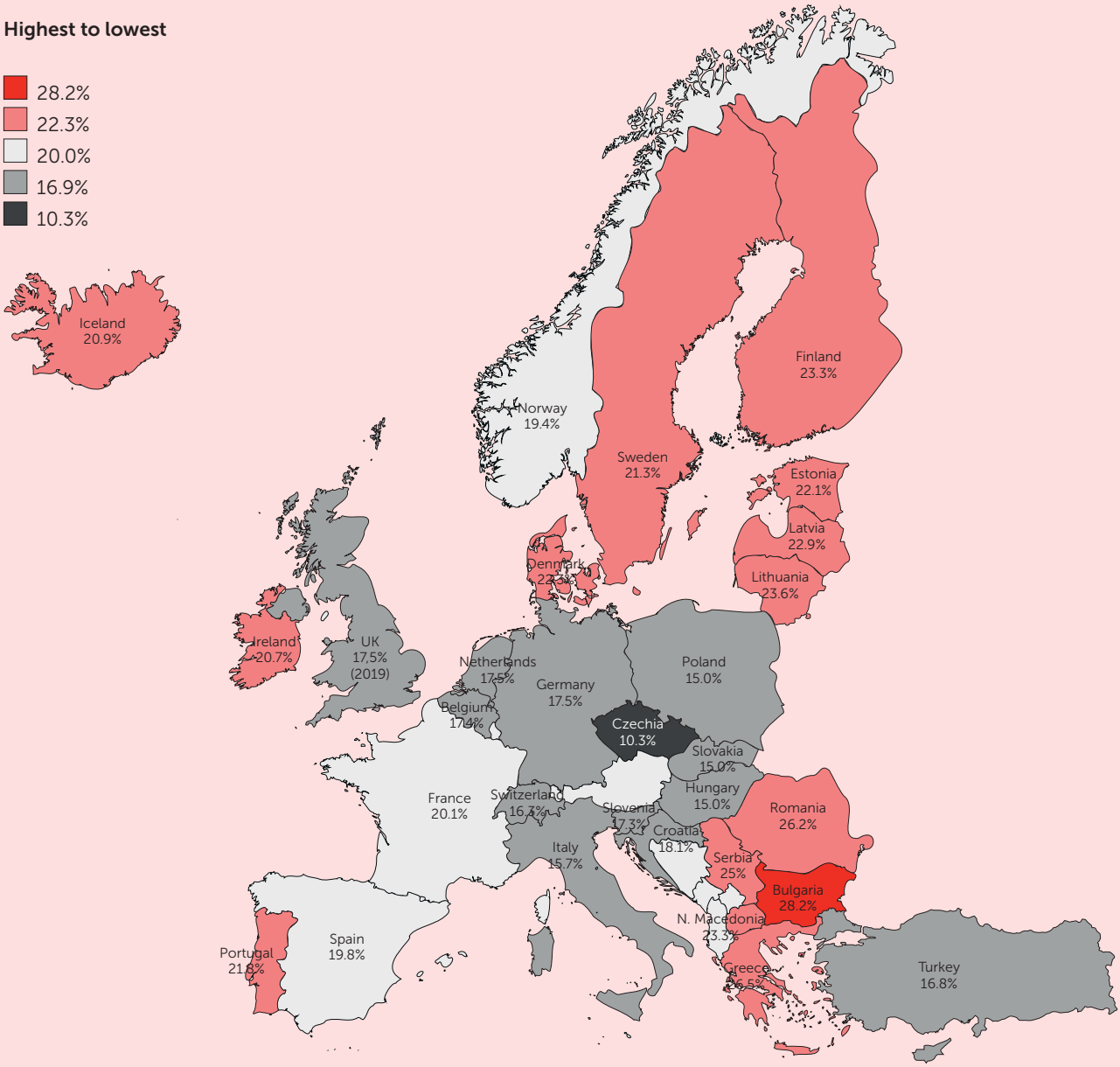


Fig.2: Highest to Lowest % of Women in Tech in EU & UK

A VIEW ON THE FACTS & FIGURES

"Looking at the overall tech industry, I do not see real progress. The gender ratio in STEM studies is frozen at a very low level, and even in areas where women are equally represented when entering the job market, their ratio drops over the course of their careers. What makes me most concerned here is that, especially in young companies, in startups, the female ratio is alarmingly low."

Jutta Horstmann, Chief Operating Officer, eyeo

GIRLS & WOMEN IN THE TECH PIPELINE

The irony in viewing the current facts & figures on women in tech is the fact that women were actually those who pioneered computer programming – but, as the statistics have clearly shown, there has been a significant backslide in their proportion of the tech sector. This relapse is reverberating throughout the entire pipeline of female talent in technology. In the U.S., for example, a 2021 McKinsey study reveals that the tech industry (particularly in the fields of hardware and IT and Telecom) is faced with the greatest struggle among all industries to attract entry-level women. If we take a brief look upwards to the sample pipeline based on McKinsey figures, it once again becomes clear that women are far less likely than men to become managers (for more on this topic, dip into our 2020 eco Association study on Women in Tech Across the Globe).

GIRLS' LEVEL OF PIPELINE				WOMEN'S LEVEL OF PIPELINE **% of Women**				
Kinder-garten	Primary School	Secondary School	College	Career Entry **33%**	Manager **22%**	Senior Manager **19%**	VP **14%**	C-Suite **14%**

Source: Hardware and IT statistics from McKinsey Study, 2021

SHIFTING THE DIAL FOR GIRLS IN TECH

"At eyeo, we are able to shift the imbalance continuously to the better. We're proud that, over the last ten years, we doubled the female ratio of employees from around 20% to now over 44%."

Jutta Horstmann, Chief Operating Officer, eyeo

In this white paper, our primary focus is on the first rungs of the pipeline – starting from kindergarten and working up to higher education. Because, ultimately, the gender imbalance in the tech sector does not just emerge at an age when women initially embark on their careers; on the contrary, this is triggered at toddler level and becomes more and more entrenched as girls grow up. Table 3 below sets out seven additional facts & figures on these early – and crucial – rungs of the pipeline.

TABLE 3: GENDER IMBALANCE IN DIGITAL EDUCATION – BASELINE FACTS & FIGURES

1. In the U.S., female students make up 49% of the primary school students enrolled in computer science, 44% of the secondary school students, but only 31% of high school students enrolled in foundational computer science. Code.org Advocacy Coalition, 2021

2. Across the EU, the number of young men aged between 16 and 24 who can program is twice as high as the number of young women of the same age. OECD, 2020

3. In the U.S., nearly three times as many male students (33%) compared to female students (12%) expressed interest in pursuing a tech career in the future. Google & Gallup, 2020

4. Across the globe, women and girls are four times less likely than boys and men to know how to program computers. UNESCO, 2021

5. Across 39 OECD member states, just 20% of computer science tertiary graduates are female. In a substantial number of EU countries such as France, Netherlands, and the UK, the proportion of female tech graduates is even lower than 15%. OECD, 2022

6. In Germany, the numbers are somewhat higher, with 22% of computer science students in 2020/2021 being women. However, no real rise has occurred in the numbers from the previous two years. Destatis, 2021

7. The numbers in the U.S. are also higher, with one in four tech graduates in the U.S. today being women. In the U.S., however, it is estimated that 37% of women switch away from tech majors, compared with 30% on average across all degrees. Accenture, 2020

A VIEW ON THE FACTS & FIGURES

"In Lisbon, I was a lecturer at the Electronic, Telecommunications and Computer Engineering Department of the Superior Engineering Institute (ISEL). I taught embedded systems, courses like Digital Systems and Microprocessors. My students were mainly male, as were my colleagues. Before, as a student, the majority of my student colleagues were male as well! When I left my academic career and moved to the industry 14 years ago, I was also often the only 'woman' in the room. Things have changed somewhat since then in terms of boosting gender balance and empowering women in tech: but there is still a long way to go. What needs to become the norm: There is nothing about tech that one cannot understand or implement only because of being a woman!"

Maria Barros Weiss, VP of Digital Ecosystems Solutions at IONOS, former lecturer

WHY CLOSING THE DIGITAL SKILLS GAP MATTERS SO MUCH FOR GIRLS

DIGITAL SKILLS AS PREPARATION FOR THE LABOR MARKET

In February 2020, in its communication on "Shaping Europe's digital future," the EU Commission highlighted that 90% of future jobs will require digital competencies. In the rapidly changing 21st century, ICT skills are becoming a preeminent aspect of the workplace and will not just significantly enhance girls' preparedness for the future of work, but will also become essential for gender equality.

DIGITAL SKILLS HELP TO CLOSE THE GENDER PAY GAP

Gaining ICT skills leads to the acquisition of better wages. As a number of studies show, specialist tech jobs are among the best-paying jobs for women – and men.

DIGITAL SKILLS ARE ESSENTIAL FOR SAFETY

As the OECD points out, developing digital skills in childhood is important to ensure girls' safe engagement with digital technologies. Historic offline patterns of abuse, exclusion, and discrimination can be mirrored and even magnified when females enter the online space. Given the world's inexorable digital transformation, girls must gain trust in these technologies – and gain digital competence to ensure their safety.

DIGITAL SKILLS EMPOWER AN ACTIVE AND ETHICAL DIGITAL GENERATION AND ENHANCE POLITICAL ENGAGEMENT

Digital skills are gaining in value for an active, positive, and responsible engagement in society. For example, as a UNESCO study indicates, learning to use ICTs effectively can be a transformative experience for women and girls, and lay the foundations for movements and activism that further the cause of gender equality.

A VIEW ON THE FACTS & FIGURES

"The status quo in the tech industry is not at all satisfactory. According to the German federal government's latest equality report, the digital industry in Germany is still predominantly male – only one in six of all employees in the field are female. We need to pave the way early on in order to have girls and women enter technical professions later on down the line. To do this, traditional patterns must be broken and the socialization and education of our children must be completely detached from conventional notions regarding certain professions. This also means that we need to introduce girls and women to more traditional scientific and technical courses of study, and encourage and support them in their attempts to study programming or computer science."

Sabine Schaar, Regional Vice President Sales Germany, Member of Executive Board Germany, Equinix

For all societal players – such as the IT & tech industry, policymakers & educators, parents, and civil society – all of the facts and figures which have been spelt out should act as a red alert. There is a need to **act now** to boost girls' interest and talents in tech, and to ultimately address the digital skills gap.

3. THE DIGITAL GENDER GAP: A VICIOUS CIRCLE

In order to gain a clear understanding of what decisions need to be made to attract more girls into the tech sector, we first need to get down to the core question: Just what is it that is causing the gender disparity? Not just in the past, but also in the present, a strong myth has continually soared that male and female brains are very different. Before examining the real causes of the gender disparity, let's take a moment to debunk this myth.

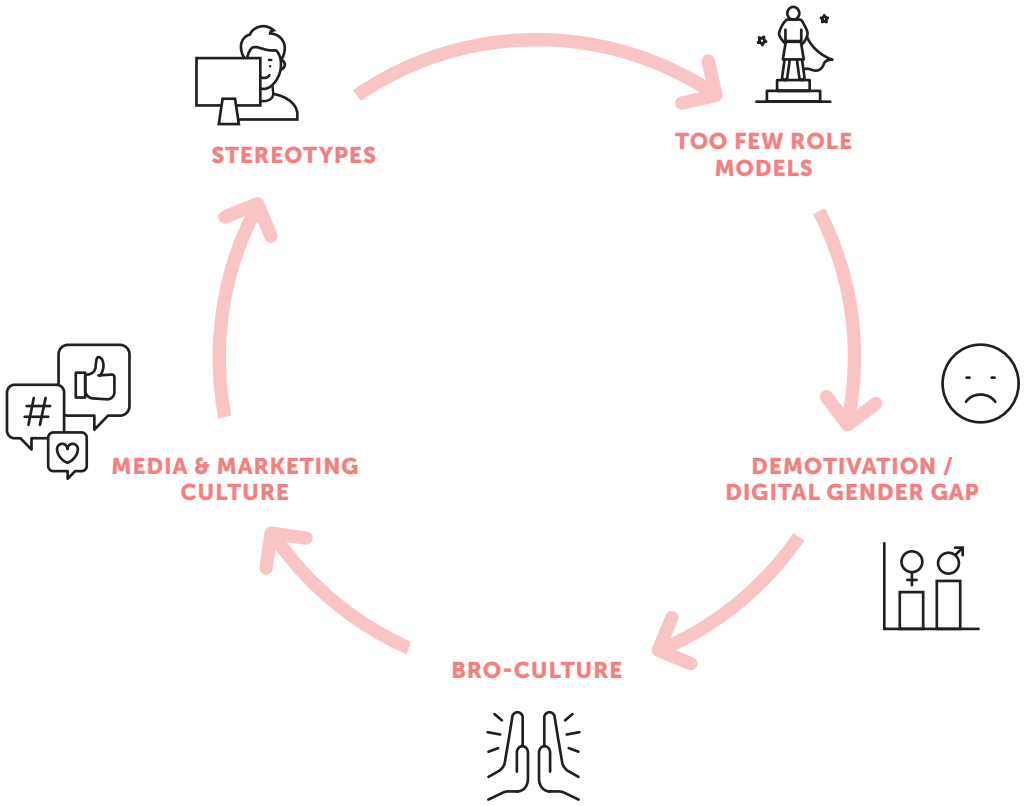
GIRLS' VS BOYS' DIGITAL POTENTIAL – IS THERE A DIFFERENCE?

Recent breakthroughs in research and neuroscience have finally put paid to the age-old myth that sex differences favored boys and men in STEM subjects, with such research proving that there is no significant gender difference in brain function or math ability: for example, Rippon's 2019 "The Gendered Brain" should help to dispel such fallacies for ever. The truth is, as the landmark 2018 OECD report "Bridging the Digital Gender Divide" relayed, girls are now outperforming boys in many STEM subjects. An earlier report from the OECD, ABC of Gender Equality in Education (2015) confirmed that differences in performance in scientific and ICT-related fields do not stem from innate differences in aptitudes – but rather from students' attitudes and confidence in their own capabilities.

At the primary and lower secondary education levels, the gender gap in actual digital competence is either non-existent or actually reversed in favor of girls. Results from the most recently completed International Computer and Information Literacy Study (ICILS) (a computer-based assessment of the skills of students aged 13 to 14 conducted in 21 countries) showed that girls scored significantly higher than boys in the majority of countries.

Girls therefore have at least as much potential as boys to master ICT skills. But sadly, by the time female students have completed higher education, only a small fraction graduate with ICT degrees. This comes down to the fact that girls' motivation drops slowly at first and then precipitously. When teenagers have reached 15 years of age, the landmark OECD report points out that a startling ten times more boys than girls would like to become tech professionals. Young women are therefore not aspiring to tech careers.

Given girls' unequivocal potential to become tech professionals and leaders, the question is – why are so many turning away from what should really be seen as an irresistible sector? The answer to this question is complex and multi-faceted, with demotivation stemming from society in general. The findings of key studies help us to pin down the primary causes – all of which are part of a vicious circle.



STEREOTYPES IN EDUCATION & UPBRINGING:

While we might like to believe that the notion of having specific occupations for men and women is outdated, this is unfortunately not the case. Career choice is still largely determined by gender stereotypes. To take an example from one country: A UK study by the Centre for Longitudinal Studies revealed the following aspirations among 14 year-old girls and boys: For girls, the top three jobs they aspired to were the medical profession, a secondary school teacher, or a singer. For boys, the top three were to be a professional sportsman, a software developer, or an engineer. To sum this up: the careers that are in boys' sight generally have a higher status and better wages, with such gender stereotypes serving as gatekeepers to higher echelons of power.

As the German "Cliche Free initiative" points out, such stereotypes are firmly anchored in society and begin to shape separate notions of "femininity" and "masculinity" from early childhood. OECD data, collected within the framework of the PISA test, shows that career expectations are molded at a very early stage. The imbalance in tech skills and aspirations starts to take shape in childhood and is largely fueled by these gender stereotypes. The European Institute for Gender Equality points to girls and boys already being exposed to the highly segregated world of work in terms of gender bias in school curriculum and a female-dominated educational workforce. In this context, a UK survey conducted by Accenture confirms that more than half of teachers have developed an unconscious gender stereotype when it comes to STEM-based subjects. On top of that, the same survey found that cues from parents can exacerbate small differences between boys and girls that can snowball into gender-skewed educational and career paths. The end effect is that girls and women are more inclined to suffer from a tech or math anxiety and are more likely to engage in self-censorship – particularly when it comes to digital skills such as coding or use of ICT for their own entrepreneurial activities. The chain reaction leads to a lack of attraction among girls to ICT education, particularly in its classic form (Empirica, 2018).

A VIEW ON STEREOTYPES

"Stop telling girls they can't do maths, aren't technically gifted, are unskilled at DIY, or are unable to park a car properly. Sentences like these feed into the fact that women in general doubt themselves more than men. I'm grateful that my father never used such limiting phrases towards me. He always encouraged me and taught me how to change tires, drive a forklift truck, or wire a ceiling light. Many of my female friends can't do such things because they strongly believe that they can't. No one has ever shown them how to manage such things. Because this is what society thinks and tells them: 'That's not something for girls!' Or if you hear someone keep telling girls that they are bad at mental arithmetic, then this belief system manifests itself (aka a confirmation bias). Then it's absolutely no surprise at all that they no longer enjoy solving maths problems, and it is only logical that they become slower and worse at maths, because they check their results several times due to their doubts in their own abilities."

Hanna von der Au, Senior PR Manager & Project Manager #LiT – Ladies in Tech, eco Association

TOO FEW FEMALE ROLE MODELS & LEADERS:

These stereotypes are reinforced by the lack of female role models in the Internet industry, and particularly by the low number of women in leadership roles. Paradoxically, as reported by a Forbes study, girls and women are anything but averse to the prospect of leadership – in fact, female entrants to the workforce generally start off with a higher level of ambition to rise to top management than men, but this ambition sinks quite rapidly within two years. The truth is: People get inspired to do something when they see others like them do it. In a 2018 Microsoft survey undertaken among females aged 11 to 30, those with role models were far more likely to imagine working in STEM fields.

Role models have a crucial function at all stages of the pipeline. For example, as a Capital One survey showed, three out of four women who stayed in tech careers had role models, compared with 56% of those who left. Ultimately, when girls see women in roles, they find it easier to imagine themselves in those positions and are more likely to put themselves forward. In addition, when they see women in leadership positions, they are even more likely to visualize such roles for themselves.

Overall, the dearth of leadership in the IT & tech industry is having a direct impact on girls and their aspirations to work as tech professionals. To quote the civil rights activist Marian Wright Edelman, "You can't be what you can't see."

A VIEW ON ROLE MODELS & LEADERS

"We need more women who are committed to equality and who are not afraid to take the initiative and responsibility for themselves to follow this path. This also requires role models who are women in leadership positions. A gender quota is the first step – the fact that the EU recently agreed that listed companies must have at least 40 percent women on their executive boards by 2027 shows that something is happening here."

Sabine Schaar, Regional Vice President Sales Germany, Member of Executive Board Germany, Equinix

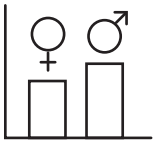
DEMOTIVATION FOR TECH CAREERS IN HIGH-INCOME REGIONS:

An additional and often overlooked issue influencing women's aspirations is their greater degree of demotivation in some regions. For example, a study by the Vodafone Institute for Society and Communications shows that the levels of optimism in contemplating tech careers are around twice as high in India as in Germany. Intriguingly, a UNESCO study goes on to show that countries with low levels of gender equality, such as those in the Arab region, have the highest proportions of women completing advanced technology degrees. Conversely, countries with the highest levels of gender equality globally – such as Finland, Iceland, and Sweden – often have very few girls choosing to study ICT or to enter the tech field. Social scientists have floated different hypotheses to explain this paradox, including theories that women in countries with low levels of gender equality are more attracted to tech jobs because they provide the clearest pathways to independence. But what has also been clearly identified is that, in higher-income countries, girls have lower levels of confidence than boys. On average, girls aged 15 believe less in their own talents than boys of the same age, with this revealed by an analysis of the 2018 Pisa study published in the journal Science Advances.

A VIEW ON DEMOTIVATION FOR TECH CAREERS

"As far as I see it, the fact that girls in more egalitarian countries have a lower tendency to consider a tech career path than girls in lower-income countries can have a lot to do with those girls' preference to steer clear of any workplace which they see as a boys' club. While luckily big strides are being taken by the IT & tech industry in creating diverse cultures, there is still a long way to go: particularly because most companies still have far more male than female colleagues. This can be a bit of a 'chicken or an egg' scenario. What we absolutely need to prioritize is to have male allies who play a central role within these diverse cultures. To achieve this, boys themselves must also be raised with the value of diversity strongly in sight."

Oliver Süme, Chair of the Board, eco – Association of the Internet Industry



WIDER DIGITAL GENDER GAP IN LOWER-INCOME REGIONS:

While girls in lower-income countries might be more motivated to pursue tech careers, they are confronted with a further issue: As a 2021 study conducted by the World Wide Web Foundation revealed, in 32 low- and lower-middle-income countries (including India, Egypt, and Nigeria), just a third of women are connected to the Internet compared with almost half of men, with this digital gender gap having barely improved since 2011. At the October 2021 African Symposium on Women and Girls in Technology, Mlambo-Ngcuka, former executive director of UN Women, warned: "We will not achieve gender equality until we eliminate this digital gap that keeps so many women offline and away from the opportunities the Internet provides." The digital gender gap has clear repercussions in quelling girls' aspirations to become women in tech.

BRO-CULTURE:

Today, the tech industry largely remains as a boy's club. Women in the tech industry can often be islands of one, especially as they advance in their careers. For example, the TrustRadius 2021 Women in Tech Report found that 72% of women in tech are outnumbered by men in business meetings by a ratio of at least 2:1, while 26% report being outnumbered by 5:1 or more. In such environments, teams which are predominantly male can (even if unintentionally) contribute to a masculine or even a macho organizational culture, which is regarded as being more alienating to women. As the TrustRadius Report went on to signify, 72% of women in tech feel that they have experienced a pervasive "bro-culture." Similarly, in the U.S., a Catalyst study reports that 73% of women in tech jobs "feel like an outsider" in their companies, compared to just 17% of men. Such a culture can be strongly underpinned by gender bias: for example, women in tech statistics from 2021 reveal that 50% of such women believe they have experienced gender discrimination at work, while the 2020 State of Women in Tech and Startups survey found that 70% of these women feel they have been treated differently at work owing to their gender – while only 11% of men in tech feel this way. In particular, an internal organizational culture that lends weight to societal biases can have a particularly insidious effect on gender equality in the workplace – and can send out strong signals to girls in society regarding the appeal, or otherwise, of entering such cultures.

A VIEW ON THE BRO-CULTURE

"I've lost a job more than once because I refused to follow the old boys club's rules. I've asked too many questions that made those boys feel uncomfortable and I've spoilered too many meetings by presenting my own plans or strategies. Initially, I didn't understand what I had done wrong until an old companion of mine said that I was obviously intimidating the boys. Simply because I did my job with a passion. After 25+ years in the tech industry, I learned my lessons. Not particularly well and very often the hard way but I never kept my mouth shut. Unfortunately, gender imbalance and the old boys' clubs still exist in the year 2022. Very little has changed. Now I feel that it's my turn to stand up and shout out loud."

Patricia Hillebrand, International Channel Manager, RNT Rausch GmbH

SHIFTING THE DIAL FOR GIRLS IN TECH

"What we absolutely need to prioritize is to have male allies who play a central role within tech companies' cultures. To achieve this, boys themselves must also be raised with the value of diversity strongly in sight."

Oliver Süme, Chair of the Board, eco - Association of the Internet Industry

MEDIA & MARKETING CULTURE:

Throughout the world, the media and marketing branches also play a critical role in shaping girls' view of digitalization and their aspirations to enter the tech industry. As sociologist Niklas Luhmann points out, "Everything we know about our society, we know through the mass media" – in other words, media discourse often forms opinions, whether positive or negative. One of the most critical ways in which media shapes people's perception of society is by helping to build or break stereotypes – think of tech memes, hacker icons, or the characters from "Big Bang Theory" or "The IT Crowd."

In many cases, the perceptions that these cultivate are deeply subconscious. People without any explicit prejudice that can be measured still demonstrate bias – not only towards other people, but also towards themselves. Such bias is not likely to have decelerated in the recent years: conversely, during the pandemic, "screen time" for children rocketed (with a 2021 IZI study showing that 0-8 year olds in the U.S. spent an average of 144 minutes per day on screens). Media and marketing messages are therefore becoming even more influential. Com-

bined with gender-specific marketing of clothes, toys, and job possibilities, current screen time is contributing to a "pinkification" of girls and a greater aversion when it comes to the acquisition of tech skills, with – as Next Generation points out – technology presented more as a boys' club where girls don't fit in.

SHIFTING THE DIAL FOR GIRLS IN TECH

"Growing up in a digital world implies that you need to learn at least the basics of the technology you're dealing with. Don't be afraid to dig into the details of technology and always try to break it so you can learn how to fix it. Never stop asking questions and always check (online) sources of information carefully before trusting them. Never, ever listen to someone telling you that tech is only a boy's thing. That's absolutely NOT TRUE! Go and discover the fascinating digital world. Don't let anybody stop you."

Patricia Hillebrand, International Channel Manager, RNT Rausch GmbH

IN CONVERSATION WITH ESTHER KIONI
SENIOR DIRECTOR, TRAINING AND E-LEARNING AT THE INTERNET SOCIETY

STOP STEREOTYPING

You've been heavily involved in the tech sector for more than three decades. Could you give us an insight into your own background, particularly with regard to what motivated you to study and engage in tech from an early age onwards?

Esther Kioni: I come from a family of ten children, with seven girls and three boys. For me, the topic of technology is something that started at home. My mother was a teacher and my father was a medic. And as we grew up, there was – unusually – no stereotyping of gender at home. My father worked in hospitals away from home, so we were raised primarily by my mother. And, from her end, she didn't see us as "boys" or "girls"; we were all simply her children. Because we had cows, all of us used to milk them. Sometimes they would break the fence and get into the maize farm. And my mother had to say, if ever the cows break the fence, you have to mend it. So, I would dig a hole, put up a pole, and pull the wires. These were of course all jobs that were generally stereotyped for men.

My dad, who was a progressive man, used to drive a Volkswagen which refused to start many times. As a very small girl, he'd put me on the driver's seat and tell me to step on the fuel pedal when fixing it. At the time, my leg would hardly reach the fuel pedal and I would push it. This made me very brave and also made me develop a positive

> **"When it comes to the issue of girls being defined or taking up careers, parents have a heavy influence right from the outset."**

attitude from an early age. I never doubted for one day in my life that I would drive a car. And when it came to my brothers, at home, they would cook for us. In heading out, my mother would say to my oldest brother, "Can you make sure the family is fed?". At the same time, academically, all of us were also expected to perform well. In my family, there are scientists, from both genders.

Ultimately, when it comes to the issue of girls being defined or taking up careers, parents have a heavy influence right from the outset. The moment when a parent starts buying dolls for a girl or toy cars for a boy, everything goes wrong. By the time they are aged four, getting into school, they already know that "I'm a girl, I'm only supposed to be doing makeup on my doll or cleaning the house" or "I'm a boy, I'm supposed to be playing with trucks or washing the car." As I see it, parenting plays an extremely strong role on gender definition.

What do you think might be thwarting girls' potential to become women in tech in developing countries? Could this be about stereotypes?

Esther Kioni: It is an issue, because even in my own village, we were laughed at for doing "boys' jobs." So, the issue concerning women in tech is real. The woman is supposed to be soft and not to do those hard jobs. But, ironically, at the same time, the woman is also expected to be the farmer, because she's the one who is on the farm most of the time. And truth be told: that is science. What's more, the fact that women are supposed to bring up and feed families – that's also science. Or women are custodians of water, or they look for firewood. Once again: Science. All of this means that women have the biggest exposure to the environment, to science, and to the family; they are the backbone of the society. And I don't know where the coin flipped – the belief that woman should be disempowered in science is so ironical.

There is also perhaps another issue, which relates to the categorization of the sciences. Life sciences have tended to be the categories that have drawn women in. The other side of the equation is the types of sciences that have been more connected to machines. These are the ones that have drawn more men in. While we have seen our girls being mechanics, the fact that men are more muscular in their stature and were therefore more regularly connected to machines, it somehow got to be interpreted that they were the better scientists.

For all of us, and the world that we are in now, we can no longer afford to say that "You can do this and you cannot do that" from a very early point in life. And when I go for baby showers, that is what I usually share. Nowadays, expectant mothers know from a very

> **"At the very grassroots, role playing has to be broken down, children have to be laced with all the skills that are required for survival: not women's skills, not men's skills: skills for survival."**

early stage what they are about to bring into the world. And you can see what they are buying: a lot of pinks for girls, a lot of blues and dark colors for boys. But what all of us must do, and what I tell them is: "Do not 'isolate' this child and define them as either boys or girls." Let's look at things from another angle. The boys of today are suffering in our world. When I was studying my Masters in the Netherlands, I was in a student house along with students from multiple countries. Seven of these were men from Ethiopia, and on my first two days there, I ended up cooking for them! On the third day, they came knocking at my door, looking for food. I went ahead and cooked for them on that third day. But after that, I told them "My brothers, your stomach will teach you how to cook."

What I'm saying here is that, in some countries, the roles of women and men are so defined that men go hungry, as they can't cook for themselves. So, as parents: when we are raising children, let the boys know how to cook, let the girls know how to fix a car. At the very grassroots, role playing has to be broken down, children have to be laced with all the skills that are required for survival: not women's skills, not men's skills: skills for survival.

From a policy perspective: Even in our schools, we have seen that demarcation and stereotyping, where even teachers will tell girls, "Go and sweep" and the boys are told, "Go and cut that tree." This is something that we need to look at and something that needs to be baked into our policies, especially given the fact that people who are in school are being trained for jobs that are not there. We don't even know what they'll be. We don't know the jobs that will be there in 2030, never mind 2050. So, the education system has to be that comprehensive and that wholesome in the sense that whatever comes, either for a boy or a girl, they will be able to deal with it. It has to be a societal approach.

Esther Kioni *is currently the Senior Director Training & eLearning at the Internet Society. Her work as an educationalist began 20 years ago. She started as a lecturer in the Kenya Polytechnic in mathematics and computer studies and later, as a Microsoft Certified Systems Engineer, she was involved in the design and implementation of various network solutions in the private and public sector. Her accumulated experience was instrumental in the deployment of ICT solutions in more than 300 schools and the capacity building of more than 5,000 educators. In the last 10 years, she has been an active practitioner in the conceptualization, implementation, and management of e-learning projects targeted at improving teacher education practice through the use of ICT. She holds a Bachelor of Education (Mathematics & Computer Studies) Degree from Kenyatta University, a Master of Science, specializing in Educational Technology from the University of Twente in the Netherlands, and a Post Graduate Diploma in ICT Leadership from Dublin City University.*

SHIFTING THE DIAL FOR GIRLS IN TECH

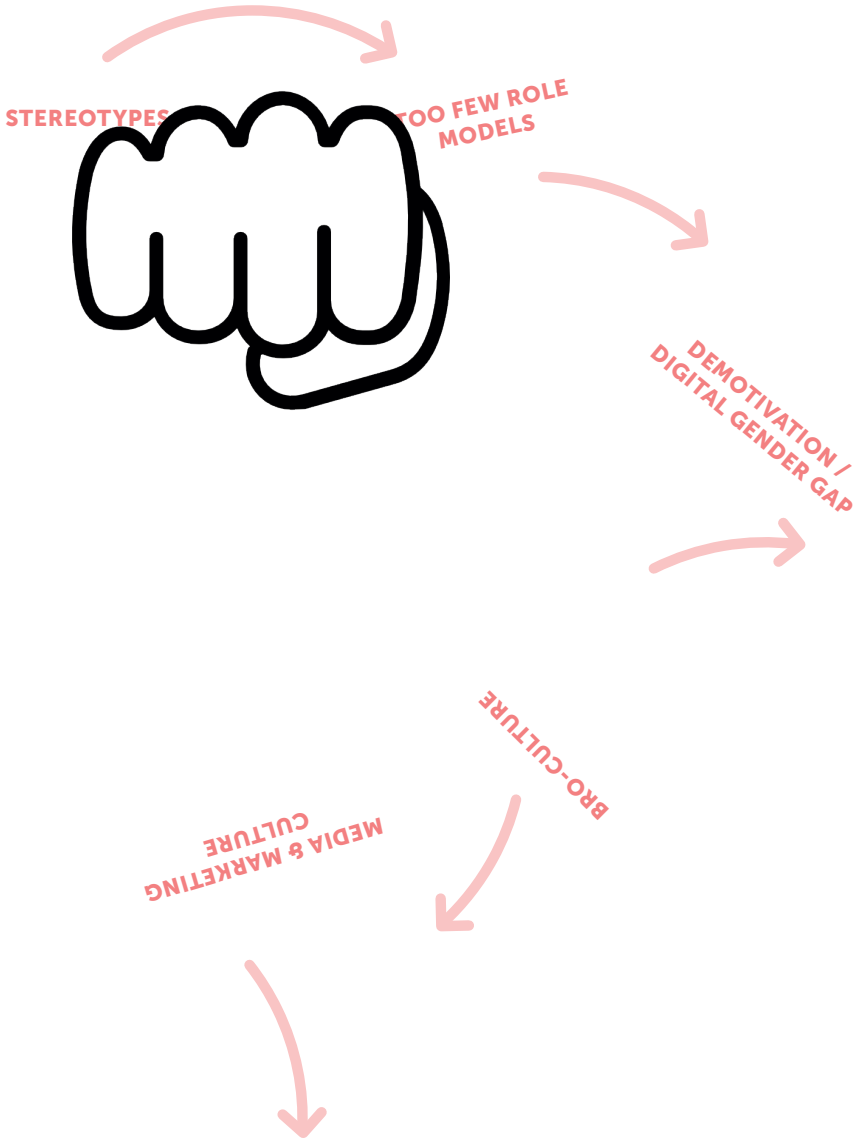
"From what I have seen – especially for those girls who have already been stereotyped and who have been told that technology is for boys and men – when that technology is baked in into what they love doing, then those fears and those stereotypes can melt away."

Esther Kioni, Senior Director, Training and e-Learning at the Internet Society

THE GENDER GAP: HOW CAN WE BREAK THE VICIOUS CIRCLE?

Given the deep-seated cultural influences affecting girls in tech, solutions to fend off the vicious circle require a mass of efforts. Society as a whole needs to take a hard look at the gender balance in the tech field in order to ensure that girls, as well as boys, are engaged in technology subjects and contribute to digital development. Complexity aside, there is one aspect which is blatantly clear: Closing the gender gap in the tech field needs to happen at the earliest possible age. From what we have already learnt, competence is not a function of gender but rather of belief, passion, and effort. Starting in kindergarten and moving up the pipeline, girls need to be provided with concrete opportunities to discover their natural wonder around technology.

The problem is too deep and multifaceted to address with singular actions – no matter how ambitious these might be. Tackling the gender gap from the earliest ages onwards is clearly a task for the whole of society. In this white paper, we now call out specifically to IT & tech companies, policymakers, educators, and parents – all of whom have critical roles to play.



4. CALL ON IT & TECH COMPANIES FOR ACTION

What exactly can IT tech companies do to tackle the challenges for young women in tech? Below we offer five core recommendations for companies.[2]

ECO'S FIVE CORE RECOMMENDATIONS FOR COMPANIES: HOW TO SUPPORT GIRLS IN TECH

1 Role models are the be-all and end-all: You should get your female experts and managers into the front row. Whether in internal or external meetings, at trade fairs, in job advertisements, in employer branding, or in PR and communication measures: the increased visibility of female specialists and leaders pays off positively for your image, attracts further female talent in the short-term, and ultimately offers a strong boost to the gender pipeline. **What insights can role models offer? Look no further – all of the conversations in this paper are offered by superlative tech role models.**

2 Don't just promote women as role models: Become a role model company yourself! Develop a corporate culture characterized by diversity – at all levels. To achieve diversity, you need to get all leaders on board, because they play a key role in shaping and implementing a diversity-oriented corporate and HR policy. Advocate for a corporate culture that consciously promotes diversity and organize diversity training for leaders and supervisors. Provide framework conditions that make it easier to reconcile work and family life. **For golden tips into how such a culture can develop and thrive, dive into our conversation with Jutta Horstmann from eyeo.**

3 As part of the culture of diversity, create space for networking and mentoring formats, with a key focus on women in leadership. Initiate an internal women's network or mentoring program or, alternatively, affiliate with external initiatives. Mentoring is a proven personnel policy instrument to support onboarding. In connection with female mentors, it also makes role models visible. On the strength of transparent company processes and rules, career development should be clearly foreseeable for employees interested in advancement. **Like to learn more about networking and mentoring? Gain great insights from our conversation with Sabine Schaar from Equinix.**

4 Consider becoming a trailblazer in collaborative development with schools, universities, NGOs or training companies, placing an emphasis on gender equality in education, training programs, and apprenticeships. Work hand-in-hand with these partners in ensuring inclusive standards. **Have a peek at our case study from Jeroen van de Lagemaat from NDIX to observe what can motivate young women.**

5 Take a new approach to employer branding and recruiting: target female applicants. Seek recommendations from female specialists and leaders, ask female company ambassadors to share a job advertisement in their networks. Make your benefits clear – for example, in terms of work-life balance. In job profiles or profiles for studies, use gender-neutral phrases. Also: Widen the playing field. If your company is committed to becoming more inclusive, consider how to appeal to candidates with transferable skills, experiences, and raw talent to get their foot in the door. Finally, to come back full circle: amply promote your company's culture to attract and empower young women in tech. **Our conversation with Lucia Falkenberg and Selin Gueldner from DE-CIX provides an exemplary illustration of the importance of corporate culture and its branding.**

[2] In our eco study from 2020 on Women in Tech Across the Globe: A Good Practice Guide for Companies, and our 2021 white paper on Women in Tech in Germany, we offer further in-depth recommendations on how tech companies can make significant inroads to attracting more girls to consider a career in tech.

A VIEW ON TECH COMPANIES' SUPPORT FOR GIRLS

"Companies can generate initial interest through Girls' Days which are didactically well prepared. But there are also companies that donate or offer special support programs for girls in tech – by funding programs tailored specifically to girls, where they are encouraged to get involved and spark enthusiasm. And, of course, introducing role models. It's important that they radiate about their great work in the companies; in that way, they inspire the new generation."

Irena von Boxberg, CEO, codiviti education

IN CONVERSATION WITH JUTTA HORSTMANN
CHIEF OPERATING OFFICER, EYEO

THE KEY FOR GIRLS IN TECH: SEEING REAL WOMEN SUCCEED IN REAL JOBS

Jutta, you're not only eyeo's COO, but you also advocate for women in leadership and are a speaker on this core topic. At the current time, 50% of eyeo's C-level management positions are occupied by women, and you are actively striving towards at least 50% in other management positions company-wide. What culture and tools have been instigated in order to work towards these goals?

Jutta Horstmann: At eyeo, we share three basic beliefs. One, in all aspects of running a business, diversity does improve the outcome. Two, women should equally take part in all decision-making processes. Three, this does not happen by itself, you can't just will it into being. It needs conscious efforts.

This generally describes the culture at eyeo, and we made it very explicit by adding "Inclusivity" to the list of our company values. We also set ourselves the goal of 50% women in leadership positions and ensured support from shareholders and company on that goal.

Next, these values and goals need to be fully put into action. Here is an incomplete list of the measures we've taken:

- Train people managers for unbiased hiring and performance assessments
- Ensure balance recruitment pipelines (the hiring manager gets presented the same amount of female and male candidates)
- Investigate the gender-related pay gap, understand and eliminate the reasons
- Invest into family-friendly working conditions (trust-based working hours, no late company-wide meetings, paid time off – e.g., for Covid-related family care, paid childcare, unlimited home office)
- Encourage male employees to take parental leave

> "For decision-makers, only paying lip service will not change anything. We need to put money where our mouth is and really invest into creating equal opportunities."

Do you see particular societal patterns that are thwarting girls' interests in entering tech professions?

Jutta Horstmann: The reasons for the shortage of women in technical professions and in leadership positions are not only to be found in companies, but also in the baseline societal setup. From very early on, girls are systematically discouraged from showing strength, claiming space, and dealing with technical topics. We, as entrepreneurs, must succeed in giving impetus to drive one of the biggest and long-overdue changes our society has ever gone through.

In order to break these molds, what tips might you offer to various stakeholders, whether it be employers, policy-makers, teachers, parents (the list can go on)?

Jutta Horstmann: The only way to overcome systemic discrimination is affirmative action – the active effort to improve employment, educational, and other opportunities for women. For decision-makers, only paying lip service will not change anything. We need to put money where our mouth is and really invest into creating equal opportunities.

For people who help raise children, like parents and teachers, my wish is that we can overcome outdated stereotypes that limit both genders in their proper development. Unfortunately, especially modern marketing and advertising strongly reinforces these stereotypes. This means that everybody in charge of caring for young people needs to counteract the messages sent by advertising and mainstream media.

If you were currently a teenage girl, are there one or two initiatives out there that you imagine would really spark your interest for a tech career?

Jutta Horstmann: As a bonus parent to two teenage girls, I see that today's situation does not differ too much from when I was young. Teenagers are cautious about any special treatment, program, or anything that sets them apart from the mainstream or their peer group. This means that this group often is not very much interested in affirmative action yet, or any specific "for girls" offerings. Nevertheless, these offerings are still very helpful, as they can provide a safe space for any girl who would like to get into tech topics, but feels they can't learn and excel in a male-dominated environment.

As a computer science graduate with over 20 years of experience in the IT sector, ***Jutta Horstmann*** *founded her own software development company and grew it over a decade. She then moved into IT consultancy and organizational transformation, bringing this experience to eyeo in 2017. Today, Jutta co-leads eyeo as one of its two Managing Directors and holds the role of COO. In organizational development, she aims for excellence in execution, based on high-performing, self-organizing agile teams. Her technological focus centers on exploring what ad filtering can and will be in the future as it moves from desktop to mobile and beyond. She is also dedicated to ensuring a welcoming, friendly, and inspiring environment across the company, where diversity is appreciated and people feel valued, further cementing the strong sense of culture at eyeo.*

SHIFTING THE DIAL FOR GIRLS IN TECH

"I think the only thing that really helps is showing kids (of both genders) real women succeeding in real jobs. Not as outliers, but as normal and mainstream as possible. Representation matters. This normality will lower the threshold for girls' entry into the tech realm and encourage them to choose a job in one of the most interesting fields available!"

Jutta Horstmann, Chief Operating Officer, eyeo

IN CONVERSATION WITH SABINE SCHAAR
REGIONAL VICE PRESIDENT SALES GERMANY, MEMBER OF EXECUTIVE BOARD GERMANY, EQUINIX

SHOULDER TO SHOULDER WITH GIRLS IN TECH

As Regional Vice President Sales at Equinix in Germany, what are the key aspects of your role?

Sabine Schaar: In my role at Equinix, I am responsible for working with my teams in further developing and implementing the sales strategy in Germany, building and strengthening customer relationships, and driving digital transformation forward, both in companies and internally at Equinix. My remit includes direct end customer business in the corporate customer segment – involving branches such as financial services, automotive, manufacturing, as well as consumer products and retail.

So it's a very diverse environment, and as a member of the Executive Board in Germany, I spend a substantial amount of time in strategic meetings, not only in helping customers to develop their digital growth strategies, but also in supporting my colleagues and teams in their development. To this end, I am also heavily engaged in coaching programs. My focus is on training future leaders ("Leaders for leaders") and championing diversity initiatives at Equinix. Not only for women, but also for our diverse communities such as LGBTQ+ or People of Color.

What aspects of your own job do you think might be particularly inspiring for girls in considering a tech career down the line?

Sabine Schaar: From my perspective, the tech industry offers the most exciting of all jobs. Working in such businesses makes it possible to set important trends in levering technology and the economy, and to connect the right technology with the right people, cultures, and businesses. The more diversity that we have underpinning developments and businesses, the more we can adapt technologies to better suit everyone's needs. That's why we need diverse

expertise – from different gender perspectives and from various societal or cultural backgrounds. If our digitalized future is to be one of equal opportunity, then women really must also be actively involved in the development of technology.

At the same time, young women in tech still find it harder to gain acceptance than in many other industries. When I started my first leadership role in IT in my mid-20s, I had very few female role models. That just has to change! We need more women who can confidently take their place in the company. For this reason, mentoring programs are also incredibly important. Something that's very close to my heart is newly defining and helping to shape the next generation of leadership culture – which is why I'm also dedicated to being a mentor and sparring partner at Equinix, and to developing and nurturing talent in my team for the long term.

Could you name some elements of the company's culture of Equinix that you think work the best for attracting and retaining young women in tech – and for helping women to rise up the ranks?

"Newly defining and helping to shape the next generation of leadership culture is something that's very close to my heart."

Sabine Schaar: Our culture at Equinix is fundamentally very open – we allow everyone to express themselves and to make a sustainable contribution to the company – and, indeed, to the world in general. Transparency is key in this respect, meaning that we place a lot of value on the diverse perspectives and thoughts of all of our employees. Ten years ago, the company launched the Equinix Women Leadership Network – a platform for women to share experiences, build leadership skills, and apply new techniques for addressing bias. In the network, we regularly talk about what framework conditions companies need to create in order to attract women as employees and bring them into leadership positions. Equinix has also launched a pilot initiative to support women in re-entering the workforce, particularly those who have been severely affected by the pandemic. Successful female applicants are hired into full-time paid positions and, through two years of on-the-job training, receive the technical skills necessary for a career in the data center industry.

What's of particular importance is an interest in technology and the motivation to use technology to make the world a little bit better. For us, diversity doesn't just come about on the strength of quotas; while this is one of our measures – and we have already made progress in this regard – the full industry still has a long way to go.

Sabine Schaar *joined Equinix in 2020 as Regional Vice President Sales. As a member of the German Executive Board, Ms. Schaar is responsible for direct end customer business for large enterprises in the German market. Previously, between 2015 and 2020, she worked at the consulting and IT/technology company Capgemini as Chief Sales Officer Business Unit Germany and subsequently as Market Segment Head of Consumer Products & Retail Germany. In her former role as a member of Lufthansa Systems' board of directors, she was responsible for sales in Germany. Ms. Schaar has a major in economics.*

SHIFTING THE DIAL FOR GIRLS IN TECH

"We are currently experiencing a shift of values in our society. Young people today have very different priorities than older people. They are growing up with technology and feel at home in social networks. At the same time, the 'Fridays for Future' generation has a strong environmental awareness and is committed to social justice. Private life is more important than careers, and pure consumption is switching over to the desire to be active in business oneself. According to a survey by Ernst & Young, 53% of 15-25 year olds would like to run their own business within the next ten years. What all of this shows: Young people want to actively and consciously help shape the future. In this regard, the tech industry in particular offers incredibly important and versatile opportunities! Digitalization makes it possible to make a contribution to the socio-geopolitical environment – whether it's through the development of Smart City concepts to make cities future-oriented, efficient, and socially inclusive; or the commitment to green IT and the question of how digital transformation can be shaped in a climate-friendly and sustainable manner. The pandemic in particular has also brought the topic of New Work and the future of work into focus – and at the same time shown that this is only made possible by technology. I see the co-design of new, hybrid work models in connection with work-life balance and homeschooling concepts as extremely exciting for a career in the tech industry."

Sabine Schaar, Regional Vice President Sales Germany, Member of Executive Board Germany, Equinix

IN CONVERSATION WITH LUCIA FALKENBERG AND SELIN GUELDNER
CHIEF PEOPLE OFFICER, DE-CIX, HR REPRESENTATIVE, DE-CIX

A SPECIAL CULTURE: DIVERSITY AS ENRICHMENT, THE INTERNET AS THE FUTURE

As the leading operator of Internet Exchanges in the world – with 30+ locations and growing strongly – DE-CIX is a company that combines a future-proof workplace with flexible working options, professional development opportunities, and a vibrant culture of diversity. Lucia and Selin: how does DE-CIX benefit from having a supportive and diverse working climate?

Lucia Falkenberg: Despite our world market leader status and the economic security that comes with it, we are innovation-driven and very proud of our special DE-CIX culture. We experience diversity as enrichment and use different experiences and perspectives as a breeding ground for creativity and new ideas.

Even in the difficult times of the pandemic, our ways of working together were characterized by mutual support. We very quickly adapted to mobile working, and we provided access to vaccinations and offered free Covid-19 antigen tests for our colleagues throughout. Now, we are really looking forward to the pandemic hopefully being over soon, so that we can meet again in person, and in particular get to know personally those who have joined us during this long period of virtual-only work. That's a lot of new colleagues, and again, we're excited about how diverse these colleagues are in terms of age, nationality, gender, etc.

Selin Gueldner: I also find that DE-CIX is very open to diversity and interculturality. And you really notice it – for example, if you speak different languages, you have opportunities to use them every day, which is such a bonus for the working environment and atmosphere here at the company.

What makes DE-CIX the right place for young women in tech to take their first professional steps?

Lucia Falkenberg: One clearly important aspect is our flexible working model. At DE-CIX, there are so many different possible variants of part-time work. As a rule, the approach is that we find solutions together when employees approach us with the need to adapt their working model to their domestic situation, such as if they want to start a family. The mobile working model that we established during the Covid-19 pandemic is an example of this, but by no means the only one. After the pandemic, we will offer new hybrid opportunities to combine the best of both worlds – mobile working and flexible office days. I think it is undisputed that this model facilitates balancing the demands of work and family.

In addition, we offer a comprehensive range of professional development opportunities and, because we are so broadly based, the opportunity to develop in very different ways. Selin, my partner in this interview, is a wonderful example of this. Having already had a successful sales career at DE-CIX, she wanted to reorient within the company after her second child. That led to her joining my team and bringing her sales skills to the HR department, a great enrichment for the team.

"One clearly important aspect is our flexible working model. At DE-CIX, there are so many different possible variants of part-time work."

Another important point is that we ensure the visibility of the women we have in our workforce. We are very proud of this diverse culture and we shout it out. Our Women in Tech are getting up on stages, they are speakers at conferences and in webinars, so that the whole world out there sees this vibrant diversity that we value so much.

On that topic, what would you say to a young woman who is thinking about how she can use her, for example, business degree and what industry she wants to go into, and she says, "Absolutely not tech. It's too male-dominated."

> **"I find the mentality, certainly at DE-CIX, is more open and less conservative than in other industries. Women are accepted for who they are, what they can do, and not simply judged on their gender."**

Lucia Falkenberg: I would tell her that I can understand that well. I studied business administration myself, and when I started working, I thought about all kinds of industries. For me, IT was all about nerds in basements surrounded by pizza boxes. Somehow, by total chance, I found myself in this Internet world early in my career, and honestly, it's one of the best things that ever happened to me.

My advice is: Get away from the clichés. We all wish for a world without bias, with fewer stereotypes. Start with yourself: look more closely at a company like DE-CIX and form your own opinions. We are talking about the IT and Internet world – one of the most innovative industries ever. We are talking about really excellent economic prospects for the future – something which is no longer a matter of course, especially in the current climate. And we're talking about an industry that has always been a pioneer when it comes to innovative working models and processes. So, stop thinking, start acting. Take a look at what DE-CIX has to offer and come talk to us.

Selin Gueldner: Looking at this industry, certainly there are more men than women, but I find the mentality, certainly at DE-CIX, is more open and less conservative than in other industries. Women are accepted for who they are, what they can do, and not simply judged on their gender. The mentality at DE-CIX is that everyone is appreciated for their work, for what that person can do, and not because of their gender or nationality, for example.

Lucia Falkenberg: I would like to add here that the topic of bringing more women into the technical teams has been a focus for us for several years now. I think it's remarkable that, at the time we began this initiative, it was mostly the male team heads that approached me, saying: "Lucia, please encourage more female applicants to apply. We know how good it is for the team atmosphere. We have learned how good it is for communication and for creativity and team dynamics in general." And as I said, that was a few years ago. In the meantime, we have managed to get more women to the next management level, and we have already seen the flow-on effect of this in new applicants for positions: Because we make women visible, this inspires other women to become part of DE-CIX. They have the feeling that they can live out their strengths and their experience and qualifications with us.

What advice would you give to a young woman who is thinking of applying for a job at DE-CIX?

Lucia Falkenberg: They should become part of our network. We place a lot of emphasis on diversity. We are crisis-proof, which is also important. And the Internet is the future. We are a steadily growing company with all of the classic business areas, such as marketing and sales, as well as the technical areas.

Given that we are in a knowledge industry, almost everyone who comes to us, no matter what the field, needs to have professional qualifications. Beyond that, you also need to have a certain passion for the Internet and, above all, a desire to constantly develop and learn. We invest a lot in further training. We continue to develop people, just as we develop ourselves as a company. And that's where we offer opportunities.

Lucia Falkenberg *is CPO with the eco Association and DE-CIX Management GmbH. Having joined eco in 2012, Lucia became Head of the eco New Work Competence Group in 2014. Falkenberg is the founder of eco's #LiT – Ladies in Tech initiative, which campaigns for more visibility for women in tech. As a woman working in the digital sector, Lucia benefits directly from the opportunities offered by the digital world of work.*

Selin Güldner *is a HR Representative at DE-CIX. After doing a Master's degree in cross-cultural management at the University of Bordeaux, she moved to Germany and started her career as a salesperson in the IT industry, and then joined DE-CIX in 2015 as Business Development Manager for Turkey and Benelux. After returning from parental leave in 2018, DE-CIX gave Selin the opportunity to start her career in HR.*

INTERNATIONAL CASE STUDY: STARTING OUT IN THE TECH INDUSTRY

What made DE-CIX the right place for you to work as a young woman in tech?

Meili Gault, *Project Management Assistant, DE-CIX:* As a young woman and mum, I like the flexibility, the ability to arrange my work. I'm working part-time right now, twenty-five hours a week, and yet I am able to manage projects within the Infrastructure team, which is rare. DE-CIX is really flexible as long as I do my work, which makes it a very family-friendly place. I think that's super, super important for parents.

There are many other things that makes DE-CIX the right place for me to work. One thing here worth mentioning is that, even though – for 90 or 95% of my time – I'm the only woman in meetings or in the office in the workplace here, it really does not feel like I'm different – a woman in contrast to the male colleagues. I've been agreeably surprised to be working only with men and not feel it as such. I think credit must be given to my colleagues for that.

Meghna Rai Sharma, *Network Service Engineer, DE-CIX:* DE-CIX is a very employee-friendly company, and we are such a rapidly growing business, so there is a lot to learn every day, especially when it comes to technology. There is also a lot of other potential for personal growth, and there are amazing colleagues to work with. The company is multicultural through and through, which I feel is even more fun.

What advice would you give to a young female graduate or job seeker who's applying for a job at DE-CIX?

Meili Gault: We're a growing company, and we're growing quicker than we can find people. So beyond technical know-how, having a strong sense of initiative is, I think, one of the key personality traits to have, because basically the amount of responsibility you can get here is based on how much you can take. There's a lot of freedom to do things the way you want to. But that means, as well, that with freedom comes responsibility. And as long as you're ready to take responsibility, then DE-CIX is really the right place for you.

Meghna Rai Sharma: I would keep it very simple: Just do your best and go for it, because the experience is worth it.

SHIFTING THE DIAL FOR GIRLS IN TECH

"At DE-CIX, we ensure the visibility of the women we have in our workforce. We are very proud of this diverse culture and we shout it out. Our Women in Tech are getting up on stages, they are speakers at conferences and in webinars, so that the whole world out there sees this vibrant diversity that we value so much."

Lucia Falkenberg, CPO DE-CIX

IN CONVERSATION WITH EVA KASPROWICZ
SENIOR ASSOCIATE, FIELDFISHER PARTNERSCHAFT VON RECHTSANWÄLTEN GMBH (LAW FIRM)

MORE VISIBILITY FOR FEMALE STARTUPS

Eva, as a senior associate in the technology, outsourcing & privacy field, could you tell us how you might perceive the tech industry from the perspective of girls – particularly when it comes to looking at prospects for startups?

Eva Kasprowicz: In my own view, the best way to describe the tech sector is: Open, dynamic, innovative, and in constant motion. There is room for new ideas and progressive solutions and you can really feel how something is happening in the tech sector. This sense of a fresh breeze is inspiring and sets off future-oriented ideas.

At the same time, it is all the more regrettable that women are still underrepresented in leadership positions as well as in the founding of startups, and that girls themselves appear to still be reluctant to consider starting up their own businesses. However, it is precisely the open spirit in the tech sector that should also encourage girls to look towards this sector down the line.

What do you think might inspire more girls to consider career options in the tech field?

Eva Kasprowicz: As already indicated, women are unfortunately still underrepresented in the tech industry. Thus, I believe it is crucial to have relatable role models to ease the concern of lack of representation and inspire confidence. In this context, women need to be represented far more on expert panels, in industry talks and specialist discussions. Women should also position themselves more confidently and proactively as business owners, even if it takes courage to do so. In addition, funding, founding, and other support services tailored to the needs of women should be expanded and communicated more strongly to women and girls.

Another big motivator from my point of view is that the tech field is a great place to lead and receive new challenges. The tech field is so diverse and offers so many growth opportunities both on a professional and personal level to keep you engaged and motivated throughout your career. What keeps you moving in your career is personal of

course. As far as I am concerned it has been the women in my personal and professional environment that have been and still inspire me today to go down the road as a tech lawyer in an industry that is constantly moving.

And last but not least: Good networks are a further essential factor. To build such networks, tech initiatives, and not necessarily a women-only network, can offer a solid platform. Any good network helps to review your own ideas for feasibility in a safe environment or makes it possible to get good advice when you are unsure what to do. It can also help to open doors and even create win-win situations. Boys and men have long been aware of the importance of supportive and value-generating networks; girls and women can learn something in this regard. And when it comes to talking about a person's own successes, boys and men are still ahead of the game. Girls and women often still tend to avoid being the center of attention or don't feel completely comfortable talking confidently about their successes.

As women, we need to change this to benefit girls. Women should venture more often to stand in the spotlight and talk about their abilities and career path. After all, this in turn supports and motivates girls!

Eva Kasprowicz *is a Senior Associate in the Technology, Outsourcing and Privacy group in Fieldfisher's Hamburg office. Prior to that, she gained several years of valuable practical experience as a legal counsel in a leading European IT management consultancy, working in the areas of IT law, data protection and public procurement law.*

DUTCH CASE STUDY: COLLABORATION WITH EDUCATORS

"In our Internet Exchange company, 31% of our employees are women, which is significantly higher than the Dutch average of 17.6%. This has much to do with how we promote an open and transparent working culture. This makes utter sense, given that the products we deliver in the market are also open and transparent. So we're open to all types of ideas and influences – not just from women, but also, for example, from young people, with a relatively large amount of young students coming here to work part-time. Embracing as many influences as possible is really part of our culture.

"At the TalentIT Twente Foundation, we work together with two female lecturers from the Saxion High School. Two women – one who studied ICT, the other who learned it herself – started a project to get more girls interested in studying and working in ICT. This started initially as a very explicit action to involve more girls. But then the feeling arose that girls were being 'placed in a corner' through that explicit targeting, which resulted in a slight sense of discomfort amongst participants. So now the project leaders make sure that, in every event they organize, external presenters are always 50% male, 50% female. Without explicitly mentioning that their particular focus is on promoting women and girls in technology, they just do it – by showing it."

Jeroen van de Lagemaat, Managing Director NDIX B.V.; Chair TalentIT Twente Foundation; Partner, "Future of Twente"

5. A DIGITAL EDUCATION AGENDA FOR POLICYMAKERS & EDUCATORS

Whereas companies play a central role in supporting girls in tech, they cannot go it alone. Creating the visibility of role models is a key action: but this would naturally be significantly strengthened if the chain of stereotypes could be broken at the earliest possible stage, allowing more and more girls and women to pour into the tech field. A pivotal action in this regard is clearly the following: digital education.

WHERE TO BEGIN? START WITH A DIGITAL EDUCATION ECOSYSTEM

As UNESCO highlighted in September 2021, in order to close the gender gap in digital education, there is a need to create an ecosystem of actors in the sphere of digital education. This requires catalyzing cooperation between policymakers, the IT & tech industry, civil society, educators, and families. Such ecosystems bring together a diversity of views, capabilities, and resources to solve the big challenges impacting both society and the economy – challenges that individual stakeholders could not solve on their own. From a governmental perspective: By working hand-in-hand with the IT & tech industry, educators, and other stakeholders, policymakers can gain a far clearer understanding of what is required for educational reforms.

Such ecosystems need to function on a spiralling effect at multiple levels: continental, national, regional, and local. In the EU, for example, the bulk of the Member States have established national coalitions for digital skills and jobs, with such coalitions creating the bedrock for digital education. A key activity that such ecosystems must focus on is the collaborative development of digital education strategies – and these should naturally be also accompanied by strong financial frameworks for stakeholders to act in. In this respect, it is good to observe that more than half of all OECD countries have published a digital education strategy in the past decade. While many of these strategies are relatively new and are therefore not yet fully assessable, the strategies that appear most likely to have a particular impetus on girls in tech embrace a distinct inclusion pillar.

Digital Education Ecosystem Strategies	**Spotlight**
Continental	The EU Digital Education Action Plan (2021-2027) is a renewed EU policy initiative to support the sustainable and effective adaptation of the education and training systems of EU Member States to the digital age. The plan applies a particular priority to fostering the development of a high-performing digital ecosystem and the enhancement of digital skills and competences. A key action of this plan includes: Women's participation in STEM.
National	The Swedish Digital Skills and Jobs Coalition had its founding meeting in 2018, with the main stakeholders being representatives of the IT & tech industry, municipalities, and school authorities. The most important driving force behind the coalition's objectives is the Swedish government's Digital Policy Strategy. Six activity areas have been estab-

lished, with one of these key activities being that of raising interest in IT among youths/girls. Side-by-side with this activity is the associated Swedish National Digitalization Strategy for the School System. This strategy is built on three focus areas.

- Digital competence for everyone, with all children and students having to develop adequate digital skills. Since 2018, digital skills have become a mandatory discipline in both primary and secondary schools.
- Equal access and use, with all children, students, and staff having to gain good and equal access to digital tools and resources in order to improve education activities.
- Research and follow-up on the possibilities of digitalization.

In order for digital education strategies to fully function, an additional key baseline requirement is omnipresent and accessible technology, with this set out in detail in the eco Association's comprehensive Internet Policy Agenda 2021. Digital infrastructures and services must not only be available and accessible to users, but also to all educational institutions and the whole of society. Digital education can only emerge in an ecosystem that comprehensively covers and addresses digital infrastructures and the services which are based on these.

IN CONVERSATION WITH ALEXANDER RABE
MANAGING DIRECTOR, ECO – ASSOCIATION OF THE INTERNET INDUSTRY

TIME TO TRANSFORM THE CURRICULUM

Alexander, the eco Association was heavily involved in supporting the creation of the coalition agreement of the new German federal government concerning digital topics. What momentum do you envisage this agreement placing on Germany's digital transformation?

Alexander Rabe: In order to achieve the digital catch-up acutely required in Germany, our clear preference at eco was for the establishment of a coordinating ministry for digitalization. But with such a ministry not on the horizon, we have consistently advocated for an overarching digital strategy that provides a clear roadmap for the digital transformation. eco was therefore happy to have such a digital strategy announced in February 2022, and we look forward to playing a constructive and collaborative role here with the combined expertise of our approximately 1,000 member companies.

How important do you find gender equality to be as a cross-cutting approach within this digital strategy?

Alexander Rabe: The greatest potential that Germany has so far left untapped is girls and women in IT and the digital industry. The image of computer science remains until today dominated by men. This can also be seen in the figures for dual work and study programs or university education. There is no reason for this to be the case. The gender gap first appears when children are about 12 years old – until then, boys and girls are equally motivated and empowered to test digital logic and offer solutions.

How do you think this can best be addressed from a digital education perspective?

Alexander Rabe: If we start to bring into the foreground "soft" motivations or the applied perspective of the IT and Internet technology surrounding us, the image of the industry could shine forth in new splendor for girls and women. But to achieve this, the curriculum framework must be changed. To this end, it's worth homing in on recommendations from the German Society for Informatics (GI), a strategic cooperation partner of the eco Association. In a GI study, they have identified the need for solid teacher training in the fields of computer science and media education. This requires a three-pronged approach:

1. An independent discipline must be established as part of teacher education degrees, covering content from computer science and media education in equal measure.
2. The teaching methodology of all subjects must rise to the challenge and further develop research and concepts for digital education.
3. Comprehensive further education and professional development offers for teachers must be established in the near term.

The bottom line for all of this: each and every teacher needs to have digital education in their curriculum and to establish didactic concepts to enable girls and boys to play an equal role in building the digital transformation of the future.

Within the education system, what do you think might work better for girls: mandatory computer science disciplines or blending tech into other subject disciplines – or a mix of both?

Alexander Rabe: Digital education, both in the independent field of learning and within other subjects, must occur continuously across all school levels for all pupils in the sense of a spiral curriculum. A basic understanding of programming, algorithmic decision logic, and the structure of data bases are prerequisites to understand how digital transformation is to be used and shaped, what possibilities and potential lie behind a click in the Internet, but also what cascades can be thus triggered and what business models may lie behind them. Not every pupil needs to become a programmer or computer scientist, but all school graduates – girls and boys – need to have understood the logic of digital transformation in order to be able to make decisions competently and to do well in their later professions. With an understanding of the functionalities and mechanisms of new digital technologies, the skepticism and anxiety regarding them will disappear almost automatically, with this being of exceptionally high relevance for girls.

What is needed to achieve this?

Alexander Rabe: Digital competence can be taught to children playfully early on in school life. Here, we are not talking about "media competence" – although this is also important – but the logic of digitalization itself. Whether this requires its own compulsory subject, or this logic can be embedded in the existing curriculum is a question for the ministers of education, the schools, and ultimately the teachers. There is much to be said for both models, but in my view, a solid integration into the curriculum as a compulsory subject would certainly have the advantage that specialist teachers would need to be trained, and they would then also have specific requirements to fulfill in the curriculum framework. We at eco are now looking forward to jointly shaping these points over the next four years.

Since January 2018, ***Alexander Rabe*** *has been Managing Director of eco – Association of the Internet Industry, the largest Internet industry association in Europe. In 2016, he took over the management of eco's Capital Office, including the division of Policy, Law and Regulations. Prior to that, Alexander was CEO of the Gesellschaft für Informatik (GI) and CEO of German Informatik Akademie GmbH in Bonn.*

SHIFTING THE DIAL FOR GIRLS IN TECH

"If we start to bring into the foreground 'soft' motivations or the applied perspective of the IT and Internet technology surrounding us, the image of the industry could shine forth in new splendor for girls and women. To achieve this, the curriculum framework must be changed."

Alexander Rabe, Managing Director, eco – Association of the Internet Industry

Digital education strategies need to cover a range of policies which explicitly address the potential for digital skills to overcome gender inequalities and to improve opportunities and outcomes for both girls and boys. What is also crucial is to have policies that ensure that teachers have the necessary skills to effectively motivate girls in tech.

Six guidelines are set out below for policies which should be at the heart of any nation's digital education strategy. The guidelines are derived from a combination of the following:

- Positions from eco Association's Policy, Law & Regulations division;
- Key insights from our interview partners and contributors;
- Multiple international studies, including:
  - A UNESCO study, entitled I'd blush if I could: closing gender divides in digital skills through education (2019)
  - Two studies from Accenture & Girls Who Code, entitled Cracking the Gender Code (2016) and Resetting Tech Culture (2020)
  - A Brookings study, entitled Building Skills for Life (2021)
  - An Empirica study, entitled diversITy. Promoting Integration and Diversity in the Digital Labor Market (2019)

Digital Education Ecosystem Strategies

Baseline:

- Digital Education Strategy
- Financial Framework
- Access & Availability of Digital Technology

Policymakers & educators, the IT & tech industry, civil society, and families

#Guideline One: **Embed Digital Competence in Kindergartens & Schools**

#Guideline Two: **Introduce and Support Parenting Initiatives**

#Guideline Three: **Embed Digital Competence in Higher Education**

#Guideline Four: **Promote and Support ICT Training and e-Learning Courses**

#Guideline Five: **Integrate Mentoring into all Digital Education Spheres**

#Guideline Six: **Support Out-of-School Programs, Clubs, and Camps**

#GUIDELINE ONE: EMBED DIGITAL COMPETENCE IN KINDERGARTENS & MAINSTREAM SCHOOLS

FOOD FOR THOUGHT

As Eurostat states, understanding digital skills and mastering the basic skills and concepts of ICT should now be perceived as a part of core education, alongside reading, writing, and numeracy. This naturally brings us to the key question: How should digital competence be embedded in mainstream schools? As Figure 3 shows, various countries across the globe have very different models for advancing digital competence in primary and secondary schools.

One clear option for embedding digital competence is to have this as a mandatory subject in all schools – both primary and secondary. For example, as a UNESCO study reports, programming experience for girls as early as the first grade has been shown to have a significant influence on technology self-efficacy and motivation. Schools can also play a major role in spotting and undoing the effects of gender stereotyping. A further strong argument can be made for introducing digital skills at the kindergarten level: as psychology research (Bian, 2017) indicates, at the age of 6, girls start categorizing boys as

COMPUTER SCIENCE EDUCATION VARIES ACROSS THE GLOBE

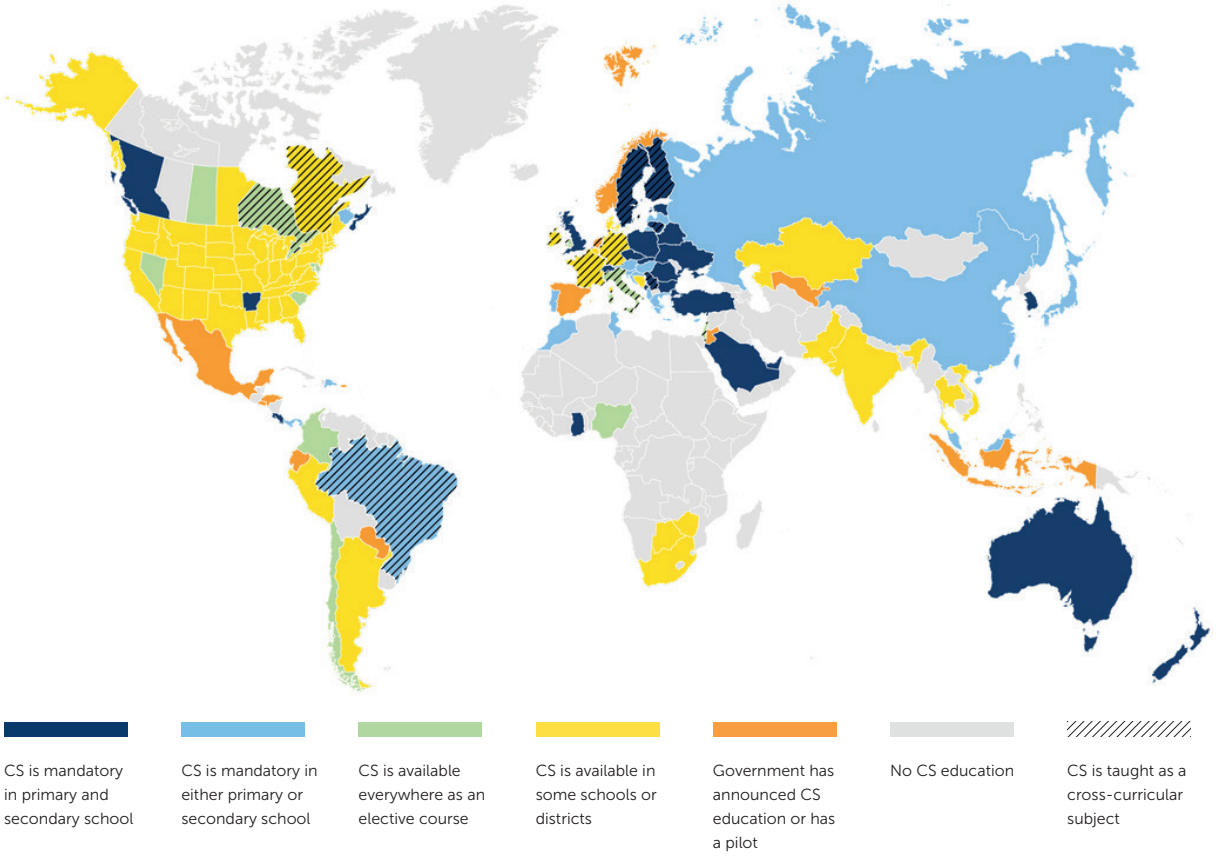


Fig. 3: ICT Education in Primary & Secondary Schools

Note: Data come from 2021, and the authors used the World Bank income-level classification system. Source: Authors' review of each education system's official curricula and related documents.

Figure 3 was devised by the Washington-based Brookings Institution and included in their 2021 study on "Building skills for life: How to expand and improve computer science education around the world"

"really, really smart" and steer themselves away from this category.

What needs to be borne in mind is that, at kindergarten and school levels, mandatory digital competence should only be introduced if it can be developed creatively in a manner which can summon up enthusiasm and instil confidence. In this regard, it is important to take on board various research findings (e.g., from Digital Scotland) which suggest that girls tend to be more drawn to the practical uses of computing rather than to be intrinsically interested in hardware or coding. What is also imperative is to contemplate education which sets girls' sights on their future career prospects. In this regard, the absolute priority is for schools to break down the chain of stereotypes. There is an urgent need to encourage and support girls (and boys) to think beyond these and to explore the full range of future career options open to them – and to also accept the fact that there is unlikely to be just one position in one sector that a child or teenager will later take on as an adult. In the meantime, the present ongoing tendency for girls to opt more for "nurturing" careers (e.g., healthcare and teaching) creates an additional argument for blending tech with transversal skills which have high transferability across different jobs and sectors (e.g., communication, problem-solving, negotiation, teamwork and collaboration, and decision-making).

In the bid to introduce educational reforms which cater to the needs set out, the target group for digital education reform is clearly not just pupils – but also teachers. It goes without saying that pupils cannot effectively learn digital skills from teachers who lack digital skills themselves. Digital training for all teachers is therefore an essential component to any intervention addressing the digital gender divide. Given that twice as many girls as boys aspire towards teacher roles, the potential for encouraging girls to consider becoming tech teachers should also be tapped into – particularly given that girls' interest in computing has been found to be significantly higher when the subject is taught by a female teacher, whereas boys' interest is unaffected by the teacher's gender (see Accenture, 2016). In a U.S. survey, 62% of secondary school girls who had a role model or mentor encouraging them to study computing or coding said they were likely to major in this subject in college, compared to 15% of girls who had no encouraging role model.

A VIEW ON CAREER ASPIRATIONS

"We need to better communicate the career options and earning potential in the tech industry. This potential is generally seen as technical, abstract, and often very one-sided – reinforcing the cliché of the nerd sitting alone in front of the computer all day programming series of numbers of 0 and 1 on his dark green screen. That is not attractive for most girls. It should be much more about what the focus should/could be in terms of the contribution that I could make by entering a tech profession. As an expert in IoT, for example, I could contribute to making our environment more sustainable and resource-efficient by having traffic lights, rubbish bins, or cars communicate with their environment in the Smart City. As an AI expert, I could code algorithms that help detect cancer in mammograms and thus save lives. In addition, more and more is based on IT. Enthusiasm for numbers is always emphasized, but there are also great options for female lawyers or humanities graduates in the tech industry. As a linguist, I could write dialogues for chat bots, as a sociologist, I could work on human-machine interaction. The storytelling here needs to be much improved and done differently."

Hanna von der Au, Senior PR Manager & Project Manager #LiT – Ladies in Tech, eco Association

RECOMMENDATIONS ON #GUIDELINE ONE

1. Baseline: Invest in digital infrastructure and connectivity for both pupils and teachers.
2. Blend technology into a range of subject disciplines such as science, sports, and the arts.
3. Introduce ICT as a core subject in the formal curriculum in both primary and secondary schools.
4. Integrate digital initiatives and inclusive digital skills games into kindergartens.
5. Train and employ specialist ICT teachers, placing a particular focus on training women in tech as role model teachers.
6. In the near term, establish comprehensive training and professional development offers for all existing teachers in the field of digital competence, including pedagogies for blended learning and diversity/unconscious bias training.
7. Establish an independent discipline as part of teacher education degrees, covering content from computer science and media education in equal measure.[3]
8. Undertake research for developing concepts for digital education, to include the co-creation of curricula and programs hand-in-hand with the IT & tech industry.
9. Teach "transversal" skills side-by-side with technical digital competence skills.
10. Commit to the continuous training of teachers working at each stage of education.
11. Enhance the career guidance system through integrating a stronger focus on digital careers.
12. Introduce a stronger vocational orientation in schools, supported through activities such as project weeks or Girls' Day programs with a focus on IT & tech.
13. Review and update the curricula to ensure that women are featured prominently in the learning materials for technology-related subjects and consider recruiting female role models from the community as a source of inspiration.
14. For pupils aged 14 upwards, offer digital work placements and mentorship using role models. (see #Guideline Five)

[3] UNESCO's ICT Competency Framework for Teachers contains guidance for incorporating ICT skills into teacher training, and is widely used across countries.

A VIEW ON THE EDUCATION SYSTEM

"For the benefit of girls, I would opt for a hybrid approach within the mainstream education system. This has a lot to do with how I see girls as being wired. As a mother of a son and two girls, and someone who was raised with boys, I believe that the wiring that is in a woman's or in a girl's mind is usually very, very interconnected. Somebody once asked: Is a computer male or female? And I think a computer is female in many respects – especially when it comes to multitasking.

"With this in mind, when it comes to education, the possibility of blending technology into biology, mathematics, chemistry, or history removes any element of intimidation. For example, a girl who loves history, or who loves home science, forgets that she's actually dealing with technology – and, eventually, she can become a master of both. But on the other hand, there are also girls from that mix for whom, of course, we need dedicated disciplines; in this sense, the hybrid model would work the best."

Esther Kioni, Senior Director, Training and e-Learning at the Internet Society

IN CONVERSATION WITH CHRISTINE SERRETTE
TECHNICAL VICE DIRECTOR, ITZBUND (GERMAN FEDERAL INFORMATION TECHNOLOGY CENTER)

DIGITAL LEARNING AS THE NEW NORM

What do you believe the industry, politics, and society should do to stimulate a greater interest among girls and women in IT & tech?

Christine Serrette: We have to start by dismantling old role models and getting girls enthused about digitalization. This starts with children's upbringing and continues from primary school. We have to empower girls and young women to believe that they can do anything and that technology is also something for girls. To make this happen, we also need more role models in our society. For example, why not see being a programmer as a typical female profession? It's also about motivating girls and not belittling them if they have a good understanding of mathematics and technology.

To this end, the ITZBund works closely with universities and aims to generate young women's interest in IT at an early stage through internships or initiatives on Girl's Day.

In your opinion, what are the main arguments as to why girls should opt for a career in tech?

Christine Serrette: Digitalization offers a multitude of versatile fields of work with a great deal of creative freedom and enormous opportunities for advancement – with the development of artificial intelligence or the topic of cybersecurity being just some of these facets. Nevertheless, only 17.5% of employees in the German IT industry are women. That is why we want to motivate women in particular to actively participate in shaping the digital transformation.

> **"The education system in Germany – from schools right through to further professional training – must become more agile and flexible."**

The pandemic has unsparingly exposed the deficits in the field of digital education. As a tech leader and as a mother, what would you like to see for children's digital education?

Christine Serrette: Anyone who wants to help shape the digital transformation and act independently in the digital world must have digital sovereignty. Digital sovereignty is an essential prerequisite for societal participation, current and future competitiveness – and thus also for our prosperity. Digital education is the key to participation in the digital world.

As such, the education system in Germany – from schools right through to further professional training – must become more agile and flexible. Covid was certainly a driver and accelerator here, and a lot has already moved forward in the last two years. Digital learning opportunities must become the standard. The prerequisite for this is further investment in the digitalization of schools. Children are often more advanced than their teachers, and teacher training urgently needs to be adapted.

Christine Serrette *studied business administration in Hamburg. In previous years, the business graduate worked for companies in the food, insurance, and IT industries in Europe and the U.S. From 2009 to 2018, she held leading positions at BWI in Bonn, including Senior Vice President, Business Consulting & Applications. Before joining ITZBund, she was Vice President Consulting Services Bundeswehr at CGI GROUP, where she was primarily responsible for IT and business processes. On 1 November 2021, she took on the role of Technical Vice Director of the ITZBund.*

SHIFTING THE DIAL FOR GIRLS IN TECH

"Digitalization offers a multitude of versatile fields of work with a great deal of creative freedom and enormous opportunities for advancement – with the development of artificial intelligence or the topic of cybersecurity being just some of these facets.

Christine Serrette, Technical Vice Director, ITZBund (German Federal Information Technology Center)

#GUIDELINE TWO: INTRODUCE AND SUPPORT PARENTING INITIATIVES

FOOD FOR THOUGHT

As a UNESCO study on closing digital divides spells out, alongside teachers, parents tend to be the biggest influencers for young people when it comes to selecting subjects and making career choices. What's more, parental support and encouragement are the most important factors for self-efficacy, for both boys and girls. While this influences all children, girls are twice as likely as boys to look to their parents for college and career advice over any other resource, and parents are girls' primary roles models (see, for example, the Techbridge white paper, Changing the Game for Girls in STEM).

Depending on their own attitudes, the influence of parents can bring the attitudes of girls themselves in opposite directions: they can either reinforce gendered stereotypes about intelligence, aptitude, and 'appropriate' fields of study for women OR they can help to dismantle these stereotypes. As the UNESCO study points out, in many contexts, parents have been found to treat daughters and sons differently in terms of ICT access and use, often introducing technology to girls later than boys, imposing more restrictions on its use, and prioritizing boys' access over that of girls. All in all, parents need to set high expectations for their daughters in terms of digital competence, on par with expectations for their sons. They also have to foresee the implications that everyday activities can have in the long run. For example, when it comes to video games, Accenture research has found that the gender divide in this activity contributes to broader digital gender divides, with stereotyping within the family likely to deter girls from playing video games. Accenture refers specifically to a study in Spain which found that fathers regularly played video games with their sons but not with their daughters, while mothers never played video games with any of their children. This reinforces the idea that certain digital activities are only for men and boys and highlights the need to generate

enthusiasm among younger girls by introducing them to coding in fun ways through computer games and toys.

So, who should be principally targeted for parenting initiatives – mothers or fathers? As UNESCO points out, mothers' expectations in particular have been found to have a more significant impact on their daughters' career choices than on the career choices of their sons. But what is also interesting to take on board is recent research into fathers' influence on gender parity – for example, a 2021 paper (Ronchi and Smith) reveals that management-level "Dads in Tech" who have daughters are more likely than other male managers to hire women, and that fathers can play a key role in fostering self-efficacy. Parenting initiatives should therefore ideally target both mothers and fathers.

RECOMMENDATIONS ON #GUIDELINE TWO

1. Within kindergartens and schools, design and implement parental outreach programs for mothers, fathers, and guardians. Such programs should be aimed at raising awareness about the importance of digital skills for girls specifically, highlighting how positive an asset they are for girls, and breaking down gendered stereotypes – for example, in how to cross gender divides in video games and social media.
2. Within communities, invite families to the program design table for consultation concerning the development of these programs – with parents in the tech sector themselves being a highly instrumental target group.
3. Work together with parents in campaigns to incentivize manufacturers to develop and promote games and toys that appeal specifically to girls.
4. Consider partnering with NGOs, local government, or the IT & tech industry to maximize effectiveness.
5. Engage directly in the topic of online safety in order to address parents' anxiety concerning girls' use of technology and to encourage parents to give girls the same access to technology as boys.

IN CONVERSATION WITH LENA SCHÖLICH
CONSULTANT AT AZOLA

AWAKENING AN EARLY PASSION FOR TECH

As a girl, what was it that kindled your interest in the digital field?

Lena Schölich: For me as a young girl, there were two aspects that were particularly decisive in kindling my interest in digital topics. One was my early access to technology. I had my first computer when I was about six years old, which allowed me to experiment and learn the basics. I still think back to one of my favorite computer games at that age, "Building Cars with Willy Werkel" (known in the UK as "Freddy Fixer," or in the U.S. as "Gary Gadget") – this allowed you to learn technical basics in a playful way and have your creativity run riot. While the content of the games was what was upfront, I learned – unconsciously at the time – how to use the PC and was soon able to help people around me with computer problems.

The second factor was definitely my passion for photography and design. I've been taking shots for as long as I can remember and have often spent hours on the computer with friends editing photos, creating collages and invitations, or editing small videos.

Both aspects were a great approach to technology, as I always had fun testing out new software and getting in touch with all kinds of digital topics.

> "I benefited enormously from the fact that I was able to learn current trends via my father and experience the rapid development myself."

Were there particular adults (e.g., parents, teachers, role models) who had an influence on your decision to enter the tech industry?

Lena Schölich: Definitely! My father has always been a tech enthusiast and that rubbed off on me early on. I benefited enormously from the fact that I was able to follow current trends through him and experience the rapid development of different technology myself. When I had technical problems, I enjoyed the challenge of solving them, knowing that I had my father as a backup person when something went wrong. He taught me a lot about storing data and security topics. Those lessons learned have saved me not only time and effort, but also sometimes my "precious" data.

In commencing your career in the tech industry, what have you found to be the most important enablers for young women?

Lena Schölich: I think it's especially important that young people get to realize that jobs in IT don't necessarily have to be all about programming. I was in the computer science club at my school from the 7th grade onwards – the will was there, but unfortunately, I myself didn't find coding to be that much fun. Due to my general affinity for technology and interest in digitalization, I kept taking several courses to search for my passion for programming – and then finally, at the end of my Master's degree, allowed myself to admit that it's perfectly okay that I'm just not into it.

But the knowledge I have gained during my several attempts has enabled me to understand the efforts needed to develop certain code and to appreciate the art of coding. And there are so many other jobs in IT besides the cliché of the "nerd in the black hoodie," and I am convinced that every person with an interest in digital topics can find their niche. To that end, I would advise young people, and especially young women, to find exciting internships or student jobs early on and to gain as many insights and networking opportunities as possible to ensure that they find this perfect niche.

All in all, the "learning by doing" and "trial and error" mentality that I've had since childhood has ultimately proven very valuable to me and has helped me solve problems in my professional life as well.

Lena Schölich *is a consultant at AZOLA and is currently supporting a client with the development and implementation of a central learning hub that promotes digital capabilities. She was previously an intern at Oracle in the Czech Republic. Prior to that, she was a Student Assistant at eco – Association of the Internet Industry and DE-CIX.*

#GUIDELINE THREE: EMBED DIGITAL COMPETENCE IN HIGHER EDUCATION

FOOD FOR THOUGHT

A large determinant as to whether young women can thrive in computer science-oriented academic programs is the university and college culture. Based on a tech student survey data, Accenture & Girls Who Code found that studying in a more-inclusive culture has a strong impact on a woman's decision to look for a job in tech. In the meantime, as technology becomes more heavily integrated into a broad range of industries, its inclusion in other academic disciplines – and not just those included under the STEM umbrella of science or engineering occupations, but also from law to manufacturing to retail to health sciences – can also make great sense. In that respect, for the majority of students who pursue careers outside of computer science, UNESCO and Brooking studies assert that foundational computer science training (alternatively referred to as "technology immersion classes") is something that should be considered by all tertiary education institutions. For example, as reported in the UNESCO study, the Harvey Mudd College in the U.S. has boosted the percentage of computer science majors who are women from 10% to 55% in a decade, in part by redesigning its first-year mandatory introductory computing course to comprise three different tracks – including one for students with no prior programming experience.

RECOMMENDATIONS ON #GUIDELINE THREE

1. Campaign amongst young women to consider computer science as a core higher education subject.
2. Develop inclusive college cultures.
3. Introduce foundational computer science.
4. Offer flexible pathways to ICT degree programs.
5. Blend digital competences into degree programs in other fields.
6. Integrate support from sponsors and businesses.
7. Implement mentorship for students, using role models (see #Guideline Five)

SHIFTING THE DIAL FOR GIRLS IN TECH

"If I were an expert in IoT, I could contribute to making our environment more sustainable and resource-efficient by having traffic lights, rubbish bins, or cars communicate with their environment in the Smart City. As an AI expert, I could code algorithms that help detect cancer in mammograms and thus save lives. As a linguist, I could write dialogues for chat bots, as a sociologist, I could work on human-machine interaction. The storytelling here needs to be much improved and done differently."

Hanna von der Au, Senior PR Manager & Project Manager #LiT – Ladies in Tech, eco Association

#GUIDELINE FOUR: PROMOTE AND SUPPORT ICT TRAINING & E-LEARNING COURSES

FOOD FOR THOUGHT

While university education is unanimously viewed as a solid pathway into the IT & tech industry, expert studies (for example, from Empirica) agree that a shift towards other pathways is required to meet the current demands for tech professions, with this being of particular relevance for girls. In comparison to university degrees, e-learning and training initiatives offer a more affordable, less restricted, and often a more up-to-date way of gaining experience in a chosen IT & tech field. Training programs in this field can be entered with lower qualifications, which is naturally of particular relevance for girls in the tech field, considering that their participation in earlier ICT disciplines is still far lower than among boys. Such programs can also be a stepping stone to further education and act as a transition route into tech careers. Due to shorter cycles, e-learning and training programs can be flexible in content structure and can adapt more quickly to new industry standards.

While training and e-learning programs have a strong relevance throughout the globe, in lower-income countries they should take particular precedence for girls. As reported by the Global Partnership for Education (GPE), an estimated 129 million girls worldwide remain out of school, with this leading to a distinct lack of further education prospects (see the World Bank's Education Global Practice). In particular, for those who are geographically marginalized, home-based training through e-learning offers a strong solution to closing the gender gap.

For all stakeholders with a genuine determination to bridge the gender gap, Empirica points out the strong merit to developing and recognizing credentials aside from classic degrees and certificates. One option here is suggested to be the use of alternative certification methods such as ICT vendor certificates or the form of badging (e.g., OpenBadge), with the latter allowing even small and micro courses and training 'bits' to be certified.

RECOMMENDATIONS ON #GUIDELINE FOUR

1. As a baseline, governments across the globe must ensure nationwide broadband connectivity.
2. To narrow the gender gap, governments should also support NGOs and institutions to offer training courses which can be targeted at absolute beginners right up to advanced programmers, with such courses requiring an upfront focus on inclusivity.
3. Public and privately sponsored workshops on specialist topics should also be offered to young women with a view to raising the possibility of a transition to tech-based careers.
4. Where appropriate, training organizations should consider including a mix of technical and experiential learning, including classroom or online-oriented learning and company placements.
5. The IT & tech industry itself should boost the attractiveness of such training programs by allowing a better permeability for career entry. There are several options in this respect, with one being to accept ICT vendor certificates or badges, and a second relating to offering apprenticeships to trainees.
6. Policymakers should support gender inclusive training providers in having options for certifying their courses.
7. Mentorship should be integrated where possible into the training initiatives. (see #Guideline Five)

SHIFTING THE DIAL FOR GIRLS IN TECH

"There are so many other jobs in IT besides the cliché of the 'nerd in the black hoodie' and I am convinced that every person with an interest in digital topics can find their niche."

Lena Schölich, Consultant at Azola

IN CONVERSATION WITH ESTHER KIONI
SENIOR DIRECTOR, TRAINING AND E-LEARNING AT THE INTERNET SOCIETY

TRAINING MUST BE EVERYWHERE

Esther, as the Senior Director of Training and e-Learning at the Internet Society, could you outline the initiatives that you manage?

Esther Kioni: Our initiatives are all about training and e-learning. Before I joined ISOC in 2020, this used to be carried out on a face-to-face mode. But, of course, from 2020 until now, everything has been online. At the moment, we have 12 courses but, by the end of this year, we are going to have 17. These courses are in three different tracks: technical, knowledge exchange & policy and advocacy skills. The courses are either moderated, in which case a moderator meets with the participants for an hour once a week to answer questions in a virtual live session, or in a self-paced format where the learner goes through the course to the very end on their own.

The courses are offered in three formats: high bandwidth, low bandwidth, and text based. This is because the Internet Society is all about making the Internet available to everyone. Although one person might be able to access content in video format, another person might not have the bandwidth to do so. This is our reason for also packaging text-based versions in PDFs, where the trainees can access the same quality of content as those who have the videos and images. We also have the content in three languages: English, Spanish, and French. In some courses, we are also now exporting the content to Arabic to cater for the Middle East and North African region.

> **"As an educator, I have perceived that most people see learning and education as "formal education." But I always tell young people that training is everywhere."**

What was the impetus for the formation of these initiatives?

Esther Kioni: As an educator, I have perceived that most people see learning and education as "formal education." But I always tell young people that training is everywhere. Think of aeronautical engineers, or medics, or farmers. Every career has a training component. So when you talk about the Internet being made available to everybody in the world, as a new technology that is pervasive and that everybody can use, training is also required in this agenda. Everyone must be equipped with skills to use the Internet safely and to watch out for "dangers." This brings us to the concept of capacity building: Whenever a new technology is introduced, people have to be capacitated to be able to use it. Although the Internet may be available to everybody – it's everywhere, all around us – in circumstances where people don't know how to set about taking advantage of it: that is where training comes in. Training to use the Internet, training to configure the infrastructure, training to develop the policies and make sure that there is an enabling environment, training to ensure there is security. Internet security is critical because going online means getting into people's minds, into people's homes, into people's families. Everybody's on the Internet. So, there must be security. This calls for training in very many ways.

The training of the Internet Society in turn is aligned to the various projects. The Subject Matter Experts (SMEs) are the content creators. Training and e-Learning provides the instructional design expertise – in other words, to pedagogically package the content and turn the text and images into online learning content. On a regular basis,

the community with whom we work points out new requirements. For example, of those five courses that we are currently developing, one of them is on Internet security, a topic which has become very important during and after the Covid pandemic, with people now feeling completely exposed while on the Internet.

Which target groups and target countries form the focus of your work?

Esther Kioni: The mission for ISOC is the Internet for everyone, which means that, aside from countries with internal policy restrictions, our courses are open to the entire world. But of course we have a focus on those people who are difficult to reach. We find that we have a very heavy audience from the southern part of the hemisphere, and less from Europe and North America. But there's a focus, for example, on the indigenous community in Canada. Our courses and everything that we do have a global outreach. We really get excited when we see those people where these facilities are not so easily available coming on board.

*For more information about **Esther Kioni** check page 22*

SHIFTING THE DIAL FOR GIRLS IN TECH

"Whenever a new technology is introduced, people have to be capacitated to be able to use it. Although the Internet may be available to everybody – it's everywhere, all around us – in circumstances where people don't know how to set about taking advantage of it: that is where training comes in."

Esther Kioni, Senior Director Training & eLearning at the Internet Society

KENYAN CASE STUDY: INTRODUCTION TO NETWORKING

"I am presently involved in a pilot project in Kenya which just started in March 2022. The focus of this pilot project is on 18–28-year-old girls who are either at college or pre-college level, and who are seeking to identify which careers to take. In the project, we've admitted 80% girls and 20% boys.

"The content of the course, entitled 'Fundamentals for Designing and Deploying Computer Networks' (DDCN) was originally developed in the last half of 2021. This course was developed as a result of the following: The technical track is synonymous with starting on a second floor in a building. We felt there was no first floor. We therefore developed a course that built bridges between the second and the ground floor, because there was a big group of starters who were losing out and not joining the advanced courses. To start off on the second floor, skills in networking and a technical background were required. The content for this new course defines: 'What is a network? What is a protocol?' etc. It is notable that, last year, the new networking course had the highest intake in comparison to all of our courses. Moreover, since January 2022, this new course has doubled its intake.

"The pilot project in Kenya is now adopting this content. But what is particularly special about this project is that it is specifically targeting young women who have not yet decided which career route to follow and who do not have the technical skills. This is where girls tend to really lose out. Metaphorically speaking: If they directly opted for the technical track (as earlier presented) they'd be coming in when the meal has been cooked – or even when people are having the pudding! We are now calling them to the menu table and asking them, 'What do you want to be cooked?' This course is aimed at interesting girls in the technical courses of the Internet. In Kenya, this pilot project will be administered for seven months. We have a similar request from Zimbabwe, where they want to use the same course to train 1,300 18–20-year-olds between June and August of 2022.

"For this pilot project in Kenya, we have an M&E specialist – a monitoring and evaluation person. Because, for the 80% of girls who are going to be in the course, we want to get an insight into their backgrounds and see how they progress. In future, we hope to have a similar project repeated in other countries and regions."

Esther Kioni, Senior Director Training & eLearning at the Internet Society

A VIEW ON CERTIFICATION

"Companies: Stop moaning about a lack of IT pros! There are a million highly skilled IT experts out there without a degree or a certificate. They are very often young autodidacts and extremely well connected in various networks. Trust the intelligence of the crowd and listen to their advice, don't be afraid to hire them. Degrees are very often just a piece of paper."

Patricia Hillebrand, International Channel Manager, RNT Rausch GmbH

#GUIDELINE FIVE: INTEGRATE MENTORING INTO ALL DIGITAL EDUCATION SPHERES

FOOD FOR THOUGHT

As emphasized in the Empirica study, mentoring is crucial for the success of inclusive ICT education and training programs and is regarded as one of the most critical success factors for boosting girls' interest in tech careers. As the study spells out, mentors can encourage girls to choose education pathways and careers in technology through shared experiences, advice, and networking, and can act as pivotal role models, covering factors such as: questioning traditional gender roles; demonstrating career opportunities; providing practical, tried-and-tested ways on how to address obstacles; and, critically, providing network contacts.

The UNESCO study confirms that ICT mentorship programs for women and girls have been found to be effective both within and outside of the formal education sector, and goes on to advise that schools and universi-

ties should consider establishing programs that pair up the following: primary school girls with secondary school girls, secondary school girls with women attending university, and female secondary school and university students with women working in the IT & tech industry.

RECOMMENDATIONS FOR #GUIDELINE FIVE

1. Set up, support, or become part of mentoring networks to coordinate virtual and in-person meet-ups and hands-on activities for exploring ICT concepts. Such networks can be local, regional, organizational, cross-organizational, or cross-regional, allowing for both in-presence and online contact.
2. In kindergartens and schools, consider introducing peer-led learning to teach girls programming fundamentals and computational thinking in hands-on environments.
3. Campaign for educators and role model girls and women to join these mentoring networks.
4. Pair older girls and young women (e.g., between the ages of 14 and 22) with female mentors working in the IT & tech industry.
5. Link mentoring to initiatives such as workshops, clubs, and camps focused on personal development and tech empowerment – for example, have mentors as guest speakers at such initiatives.
6. Develop innovative mentorship models for an increasing use of mentorship, such as cross-organizational and cross-regional mentor networks, which can also operate online.
7. Offer training to mentors, with this ideally to be sponsored through government funding.
8. Link mentorship to incentives such as access to scholarships, internships, job opportunities, and awards.

#GUIDELINE SIX: SUPPORT OUT-OF-SCHOOL PROGRAMS, CLUBS, AND CAMPS

FOOD FOR THOUGHT

While having digital competence as a foundational subject in schools and colleges should be a prerequisite, taking topics such as programming and coding out of the classrooms is also an important method for inspiring girls and young women to think about technology jobs, given that they can make a link from something they enjoy and that is important to them to a future career path. Girls can strongly benefit from a mix of both formal and informal exposure to digital technologies. Particularly in communities where there are still delays in bringing inspirational technological education into schools, there is a need to spark girls' interest by providing an alternative opportunity to explore content. Initiatives such as tech-related programs, clubs, and camps can help girls and young women to build self-confidence and self-esteem by removing the competition that shapes their lives at school or college and to demystify the technological world all around them. Such initiatives are of value to all girls, but can be of particularly high merit for those from lower-income communities. As a study by the ITU reveals, girls from low-income communities typically have 6,000 fewer hours of enrichment activities compared with their middle-income peers.

Overall, digital learning should be enjoyable, and participating in programs, clubs, or camps – not only in schools themselves, but also in tech companies, community centers, libraries, youth hostels, camping sites – can give girls a sense of freedom and pleasure. A key way to stimulate fun in such clubs and camps is through creative games – with just one example being a combination of both sports and digital games.

RECOMMENDATIONS ON #GUIDELINE SIX

1. Out-of-school tech programs or clubs
2. Tech camps

Such initiatives can be offered for both girls and boys, and should ideally be co-sponsored by governments and tech companies – particularly in order to support children and teenagers from lower-income communities:

The offers and design should:

- Be available for different age groups
- Be designed to attract girls, without going down a stereotypical route such as fashion or beauty
- Mingle tech with creativity and transversal skills

- Allow girls to learn about the latest advancements in a wide variety of topics, such as coding, programming and app development, game design, robotics, web design, film, video, 3D modeling, and printing
- Promote games which have an educational element
- Set quotas in co-ed initiatives to boost girls' participation

COLOGNE CASE STUDY: CODIVITI EDUCATION

"codiviti education is a Cologne-based initiative which promotes digitalization skills for children aged six to 14. We offer companies creative coding programs for their Girls' Day. On this day, the girls not only get an impression of the company where the program is offered, but also gain their first programming experience. For example, with the girls, we craft and program wearables with microcontrollers. This gives them something they have programmed themselves – they can also take their wearable with them and show it off. On the strength of our annual Girls' Day programs, the girls have often gone on to complete 'career exploration days' and school internships in these companies.

"Our programs all offer a lot of room for a girl's own creativity. In our courses, we combine familiar creative processes with programming. The girls find access through what they know – through music, through storytelling, through playing around with technology. This makes it easy to inspire and engage them.

"Programs which offer particular benefits are those for very young children from the age of six. They learn what programming is all about with simple, child-friendly tools – even without technology. Getting in touch with coding at an early age prevents any fears from being bred; the girls from our primary school courses have the confidence to code and maintain an interest in the long-term. The sooner they start, the better.

"I got the idea to found 'codiviti education' in 2017. I had previously worked for many years as a designer in the advertising field. At that time, my kids were in primary school. When I came back from a trip to San Francisco and Silicon Valley, I realized that the world was changing rapidly – but not in our primary schools in Germany. Not much had happened in terms of digitalization in those schools. I wanted to change that: I wanted to give my own children an ICT education, but I also wanted to use my expertise as a communications designer to convey to a wider audience just how important the topic is.

"The teaching of digital creative skills should begin early in life. At present, I don't think schools have the capacity to do this alone. As such, there should be more support for extracurricular institutions that complement school lessons. Schools should be able to open up to programs from outside, and the state should support them in doing so, also financially – not only for technology, but above all for the education of the children, and also of the teachers. Similar to music and sports, there should be separate supplementary programs."

Irena von Boxberg, CEO, codiviti education

DUTCH CASE STUDY: STIMULATION THROUGH ROLE MODELS

"Our Dutch company NDIX is a partner of 'Future of Twente,' a women's initiative in and around the national women-soccer champion FC Twente. Young and talented women with a very diverse background stimulate other women to become successful and serve as role models, not only in football, but mainly in companies and in society as a whole. Diversity is their driving force."

Jeroen van de Lagemaat, Managing Director NDIX B.V.; Partner, "Future of Twente"

SHIFTING THE DIAL FOR GIRLS IN TECH

"In the past few years, I've detected a heightened interest among girls in becoming part of the tech industry. Parents have also picked up on the relevance in recent years and are increasingly encouraging their girls to move in this direction. There aren't just more offers, but also more and more role models and girls recognizing that this is something they can also do, which also gives them opportunities for self-expression."

Irena von Boxberg, CEO, codiviti education

IN CONVERSATION WITH REG LEVY
HEAD OF COMPLIANCE, TCX; WORKING GROUP CHAIR, I2COALITION DIVERSITY & INCLUSION INITIATIVE

GIRLS IN TECH: PLAY, FAIL & LEARN

Reg, you've been in the domain industry for more than a decade. As Head of Compliance at Tucows – and as the Working Group Chair of the i2Coalition's "Diversity & Inclusion Initiative" – you're not just a female tech leader, but also a diversity advocate. To look back at your teenage years: Were there particular initiatives that inspired you at that time to consider becoming involved in the tech industry?

Reg Levy: Going back to that time, it really was a matter of the things that I played with that interested me. I played video games, I played with computers. I had access to computers, not just as a requirement from schooling, but as things to have fun on. And because they were an integral part of my play, they became something that I was interested in, because obviously adults were using them as well. So having the opportunity to have unstructured time with computers was very formative for me.

If you were currently a teenage girl, are there one or two initiatives out there in the U.S. that you imagine would really spark your interest for a tech career?

Reg Levy: One of the things that stands out in my mind as a memory was going to Space Camp, which was sponsored by a local aerospace company. I lived in Seattle, where my father happened to work for Boeing, and they had a Space Summer Camp there. This camp was very technical and science based. There are similar initiatives now: that is, summer camps that are geared to both boys and girls, as this one was. These allow children and young adults to play with technology, to learn how things work, but also, to fail in an environment that encourages failure. Because that's part of how you learn, and that doesn't attach a stigma to that failure.

One of the initiatives that my company Tucows became involved in was a "maker space" near one of our "Ting Towns" in Charlottesville. We've since turned it over to the local library, who are now fully in charge of it. But when we started it, it was a place for anyone in the town to come and check out different machines – as if it was from a library. In this respect, we had 3D printers, we had laser engravers, and those types of things that adults could use to create things. While it was primarily geared for adults to play with, we also sponsored regular summer camps where we encouraged kids to come in and learn how to use 3D printers, and to learn how to make things with these machines.

What aspects of your own job do you think might be particularly inspiring for girls in considering a tech career down the line?

Reg Levy: Due to the fact that, as a little girl, and then as a teenager, I was allowed to play with technology and see the potential behind it, what I am now doing is a type of natural progression. A lot of what I'm doing is allowing people a safe place to play with technology. I deal with compliance on the Internet, and much of that includes telling people that they're "doing the Internet wrong," and that they need to stop. When something drifts into illegal, into dangerous, life-threatening, or child sexual abuse areas, then we absolutely shut it down. But if this isn't the case, and it's just something that somebody out there happens to not like, part of my job is to say: "No, it's alright for them to continue doing that. It is legal, or it is free speech. You just don't like it." This is all about contributing to people playing (and potentially failing) with the Internet, and giving various people the leeway to do that. If you come at me with a court order, if you show me that this is illegal, then that's excellent, we'll take it offline. But if it's not illegal and it's not dangerous, then part of my job is to allow people to continue to play with the Internet.

> **"A lot of young women are socialized, especially in Western societies, to not be allowed to fail. They're socialized with the idea that they must be perfect, because if they aren't, then they're not good enough to be the CEO, to be the vice president, to be on the board."**

For any young woman who might have just started an apprenticeship or a job in tech, what do you think are the best actions that companies can undertake to support her career and maybe help her to potentially rise up the ranks?

Reg Levy: I'm of the opinion that mentorship is extremely important. Having role models that are visible and acces-

sible are key. This can involve having a structured mentorship program, but it can also involve just saying, "Hey, our VP of cyber is a woman, here are the women on the board, and these are positions that you can hold in the future." Simply seeing and hearing such facts is important. Emphasizing and having that diversity already at the company is sort of a passive way of showing young girls that they can have a place at similar companies in the future.

But what's also important is to allow failure to take place – in other words, to allow people to make mistakes, to correct them, and to allow them to learn from it. In this regard, let's go back to the idea of play. When you play with LEGO pieces, you put them together, create something. And sometimes it's not what you intended to create, so you have to take it apart and try again. And that's part of playing with LEGO – it's not a failure; it's just play.

I personally feel like a lot of young women are socialized, especially in Western societies, to not be allowed to fail; they're socialized with the idea that they must be perfect, because if they aren't, then they're not good enough to be the CEO, to be the vice president, to be on the board. What this effectively means: Allowing young women who are in an apprenticeship, or an internship, or a company to make mistakes in a supportive environment is also good. Being upfront about your own mistakes in a public and vulnerable and honest way is also going to help young women understand that they don't have to be perfect at all times. When they have a problem, they can go to an expert, they can go to their colleagues, they can admit that they don't know what they're doing, or they thought they knew what they were doing and made a mistake, or just failed – and then reach out for help. And then we can move from there. We can help them learn.

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SHIFTING THE DIAL FOR GIRLS IN TECH

"Inspiration for girls really comes down to play, to joyful interaction with technology – whether that's video games, learning to code, or having fun with those new quasi robotic LEGO pieces. With those LEGO pieces, you can put together robots with little servos and see what they do, and see if you can create something that will go and pick something up across the table from you. Having those opportunities available to girls from an early age is extremely important. This is something that I've impressed on my sisters for their children: From an early age, I made sure that they had computers in their home so that they could teach their children. This is a thing you're going to need when you grow up, but it's not just used for adult things. This is something that can be fun. This is something that can be played with."

Reg Levy, Head of Compliance, TCX; Working Group Chair, i2Coalition Diversity & Inclusion Initiative

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