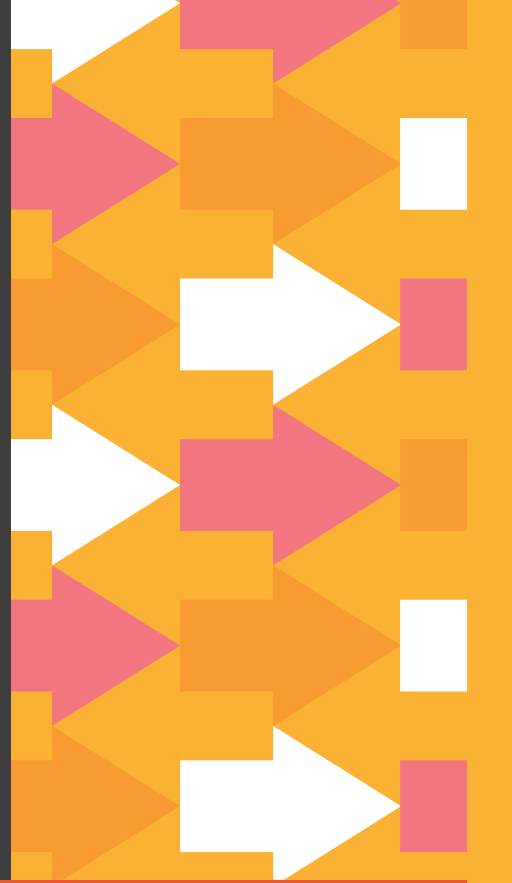December 2018

How to double our technological capabilities: 10 nudges for more #WomenInTech

Quick and low-cost behavioural measures to enlarge the labour market for tech jobs

pwc

At PwC, our purpose is to build trust in society and solve important problems. We're a network of firms in 158 countries with more than 250,000 people. At PwC in the Netherlands over 5,000 people work together. We're committed to delivering quality in assurance, tax and advisory services. Tell us what matters to you and find out more by visiting us at www.pwc.nl.

PwC refers to the PwC network and/or one or more of its member firms, each of which is a separate legal entity. Please see www.pwc.com/structure for further details.

Table of contents

How to double our technological capabilities: 10 nudges for more #WomenInTech

Quick and low-cost behavioural measures to enlarge the labour market for tech jobs

Ten nudges for more women in tech

Education

1. Provide feedback on how well girls are doing in Science, Technology, Engineering and Mathematics (STEM) compared to other subjects.
2. Eliminate clues that trigger performance-limiting stereotypes.
3. As role models matter from an early age, involve female STEM teachers and others in counter-stereotypical roles.
4. Students' attitudes can also be affected by subtle and simple changes such as diversifying the portraits on the walls of your organisations.

Hiring

5. Purge gendered language from job ads and other company communications.
6. Remember that the importance of relatability extends across various platforms of recruitment activities, from job ads to recruitment events.

Retaining

7. Do away with self-assessments wherever possible, or at least avoid sharing self-assessments with evaluators ahead of performance reviews.
8. Invite team members to speak up; explicitly invite salary negotiations.
9. Include a critical mass of women in teams to avoid tokenism.
10. Change norms through smarter messaging.

Introduction

Data analytics, artificial intelligence and smart robotics are changing the tasks we perform and the skills we need. Digitalisation and smart automation are fundamentally transforming the way we work and creating jobs for people who can apply technology to current tasks, people who can design, monitor, maintain and fix technology, and people who can optimise human-technology interaction. Many of the current tasks and jobs as we know them will change as we increasingly use new technologies to optimise the way we work.

A bright outlook? In many ways, yes. At the same time, it is very likely that many of these jobs will be occupied by male workers. Digitalisation and smart automation will create new jobs in industries that are related to technology and engineering. A disproportionately large percentage of workers in these industries are men. Of the 39.3 million women in the EU with a degree, only 1.4 million work in tech.[1] As productivity, wages and returns are higher in these jobs, part of the gender pay gap can be explained by the gender tech gap.

> Women with STEM jobs earned 35 percent more than comparable women in non-STEM jobs — even higher than the 30 percent STEM premium for men.[2]

In the Netherlands, only 15% of all mathematicians, engineers, technicians and ICT specialists are female[3]. Even though we have made considerable progress in encouraging more girls to choose STEM[4] profiles during their secondary education and university studies, only a small fraction of girls with the corresponding degrees will actually end up in a STEM-related job.

According to a major international study[5], Dutch adults score high on unconscious stereotypes regarding gender and STEM. The strong presence of this stereotypical image in most Dutch adults (and, therefore, parents and teachers), combined with the relative lack of counter-stereotypical examples for children, contributes to maintaining the stubborn stereotype that STEM is a naturally male domain.

As a result, there is a risk that female workers will benefit less from the new jobs created by automation and digitalisation, further increasing gender inequality. Additionally, if technology design and application are the primary domain of just half of the population, users are missing out on the potential insights, innovations and solutions that could be provided by the other half. Bringing more women into tech will help introduce new viewpoints and new ideas to digitalisation and smart automation.

Socio-psychological evidence shows that boys like things and girls like people. This means that even without stereotyping, social conditioning or historical prejudice, boys are on average more likely to be attracted to tech education and jobs. Nonetheless, it is clear that we need to nudge more girls into tech if we are going to maximise the way in which the current technological advances contribute to our welfare and prosperity.

Jan Willem Velthuijsen
Chief Economist

1   Eurostat, 2018. Employed ICT specialists (isoc_sks_itsps) and Employment by educational attainment level (lfsi_educ_a)
2   USA Commercial Department, 2017. Women in STEM: 2017 update
3   Statline, occupations by gender, Q2 2018, https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82808NED/table?ts=1538045097680
4   Science, technology, engineering and mathematics (STEM)
5   Miller, Eagly & Linn, 2015. Women's representation in science predicts national gender-science stereotypes: Evidence from 66 nations. Journal of Educational Psychology, 107(3), 631-644.

Why we need women in the new wave of industrialisation

The scarcity of relevant skills is a serious cause of concern for CEOs. In PwC's 2018 survey, 38% of surveyed CEOs indicated that the 'availability of key skills' presents a threat to their company's growth. Furthermore, the 'speed of technological change' was also a concern to 38% of surveyed CEOs. Some 54% of Dutch CEOs indicated that it is difficult to attract digital talent, slightly more than the global average of 50%.[6] **Accessing the full talent pool, women and men included, could be a key solution to reducing the skills gap** that worries business leaders across the world.

The participation of both men and women in the workforce is essential for the viability of businesses and economies. Mixed teams generate solutions that are more creative, with evidence showing strong links between gender diversity, collective intelligence and team performance.[7,8,9] Companies that use female talent effectively are **45%** more likely to report improved market share.[10]

Including more women in technically skilled jobs, and specifically in the emerging tech environment, is therefore of paramount financial importance for business and will have a broader socio-economic impact on countries looking to prosper.

Emerging tech is only as well-rounded as the people who teach it. In the field of artificial intelligence (AI), however, which is a linchpin of emerging tech, women hold only one fifth of executive positions.[11] It is crucial that women help shape emerging tech as our dependence on the speed and efficiency of new technologies grows every day.[12] AI is what drives how photo apps discern our faces from others, for example, and what interprets our requests for the nearest restaurants that serve a late-night snack. It also drives more niche applications – for example, in surgical procedures, or search-and-rescue missions, where it helps deploy drones to the most difficult-to-reach places on earth.[13]

Emerging tech is revolutionising how we live and work. Are women helping shape this brave new world?

AI can enable machines to complete a number of tasks that humans are capable of, including speech recognition, information gathering and decision-making. Here, data is the new oil. AI utilises vast amounts of existing data; however, if the input data is limited or biased, the output will be flawed. This is already a problem today.[14]

The demographic make-up of many emerging tech companies is largely homogeneous, which can make the industry and its products vulnerable to bias.[15] Some of the latest smartphones have had trouble implementing their innovative facial recognition technology, for instance. The reliability of this method for different ethnicities and genders has been questioned, sparking a debate over the representation of different social groups in emerging tech.[16]

If technology is primarily designed by just half of the population, users are missing out on the insights, innovations, and solutions of the other half. Fostering inclusivity, for instance by bringing more women into emerging tech and the workforce in general, would help introduce new viewpoints and ideas to the sector. Consequently, involving more women is becoming an ever more urgent goal as emerging tech gains momentum in the new industrial revolution.

6   PwC, 2018. PwC CEO Survey report 2018. Available: https://www.pwc.com/gx/en/ceo-survey/2018/pwc-ceo-survey-report-2018.pdf
7   Woolley et al., 2010. Evidence for a collective intelligence factor in the performance of human groups. Science 330: 686 – 688.
8   Forbes India, 2017. Removing workplace biases with 'behavioural design'. Available: http://www.forbesindia.com/article/rotman/removing-workplace-biases-with-behavioural-design/48945/1
9   University of Castilla la Mancha, Spain. https://www.nextgeneration.ie/why-arent-there-more-women-in-tech/
10 Forbes, 2017. Inspiring greatness: Advancing women leaders in the workplace. Available: https://www.forbes.com/sites/kpmg/2017/06/07/inspiring-greatness-advancing-women-leaders-in-the-workplace/#58bcbdc24c54
11 Google, 2017. For AI, a real-world reality check: An intelligent computer is only as well-rounded as the people who teach it. Available: https://www.google.com/about/stories/gender-balance-diversity-important-to-machine-learning/?utm_source=twitter&utm_medium=social&utm_campaign=
12 Ibid.
13 Ibid.
14 Ibid.
15 Quartz, 2014. The emerging picture of the tech industry's diversity is pretty ugly. Available: https://qz.com/222870/the-emerging-picture-of-the-tech-industrys-diversity-is-pretty-ugly/
16 New York Post, 2017. Chinese users claim iPhone X face recognition can't tell them apart. Available: https://nypost.com/2017/12/21/chinese-users-claim-iphone-x-face-recognition-cant-tell-them-apart/

Unlearning is slow and painful, but behavioural measures can offer quick wins

Rethinking the way talent is developed and deployed in today's world will require the undoing and relearning of age-old thought processes and the formation of new norms and values, especially in the education system and labour market. Biases are built deeply into our cognitive processes, and unlearning them is difficult at best. Contrary to popular belief, being made aware of our biases does not reverse them – even upon instruction, we struggle to suppress their influence.

Behavioural measures, or 'nudges', are one instrument in our collective toolbox that can help correct for gender imbalances in education and work. Nudges change the context in which we make decisions to help us achieve our goals. They can represent low-hanging fruit to promote female representation in emerging tech, and establish new foundations for inclusive economic growth.

In this report we outline some biases and countervailing nudges to help us in this endeavour, with a lifecycle view from school and higher education to hiring, career development and progression.

Does education hold the key?

The answer is complex: education is only one in a multifaceted interplay of drivers that can bring more women into skilled jobs, especially in science, technology, engineering and mathematics.
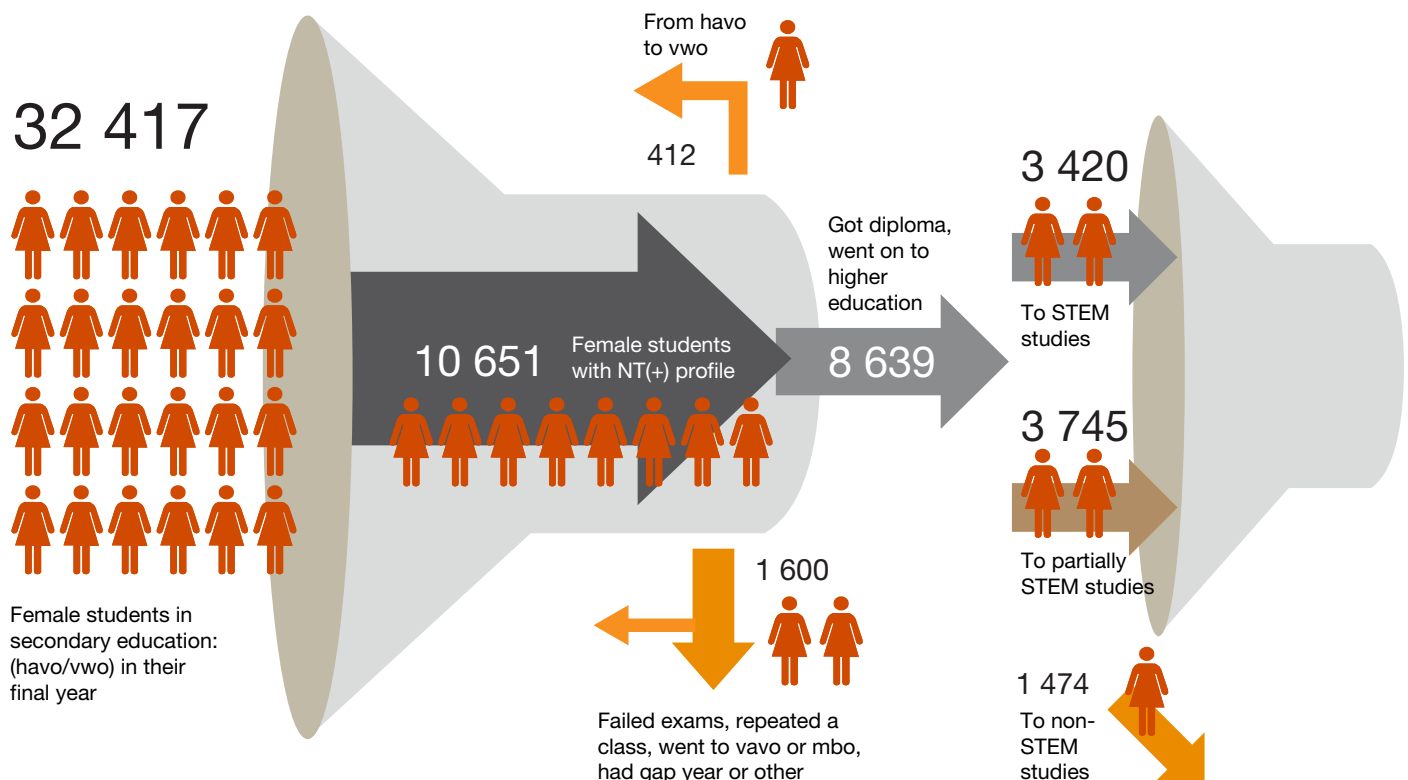
The facts: a leaky pipeline

One root cause of the lack of diversity in STEM fields can be found in the educational system. On the surface, the Netherlands is making progress towards engaging more girls in technical studies. Since 2008, the number of girls with a Nature & Technology profile in their final year of secondary education has tripled from 3,100 to 10,600. However, this is still only 27% of the female population in secondary education, whereas 42% of the male population had a Nature & Technology profile in 2016.[17]

The pipeline starts to leak when the girls reach higher education: only 40% of female graduates with a Nature & Technology profile choose a 'hard' STEM study, and 43% a study with STEM elements (see figure 1)[18]. The proportion of females to males who graduate a STEM master is even more unbalanced: women are underrepresented in maths (3:10), computer sciences (1:11) and artificial intelligence (1:4), as well as mechanical engineering (1:11).[19]

Figure 1. The STEM funnel in 2016

32 417
Female students in secondary education: (havo/vwo) in their final year

412
From havo to vwo

10 651 Female students with NT(+) profile

8 639 Got diploma, went on to higher education

1 600 Failed exams, repeated a class, went to vavo or mbo, had gap year or other

3 420 To STEM studies

3 745 To partially STEM studies
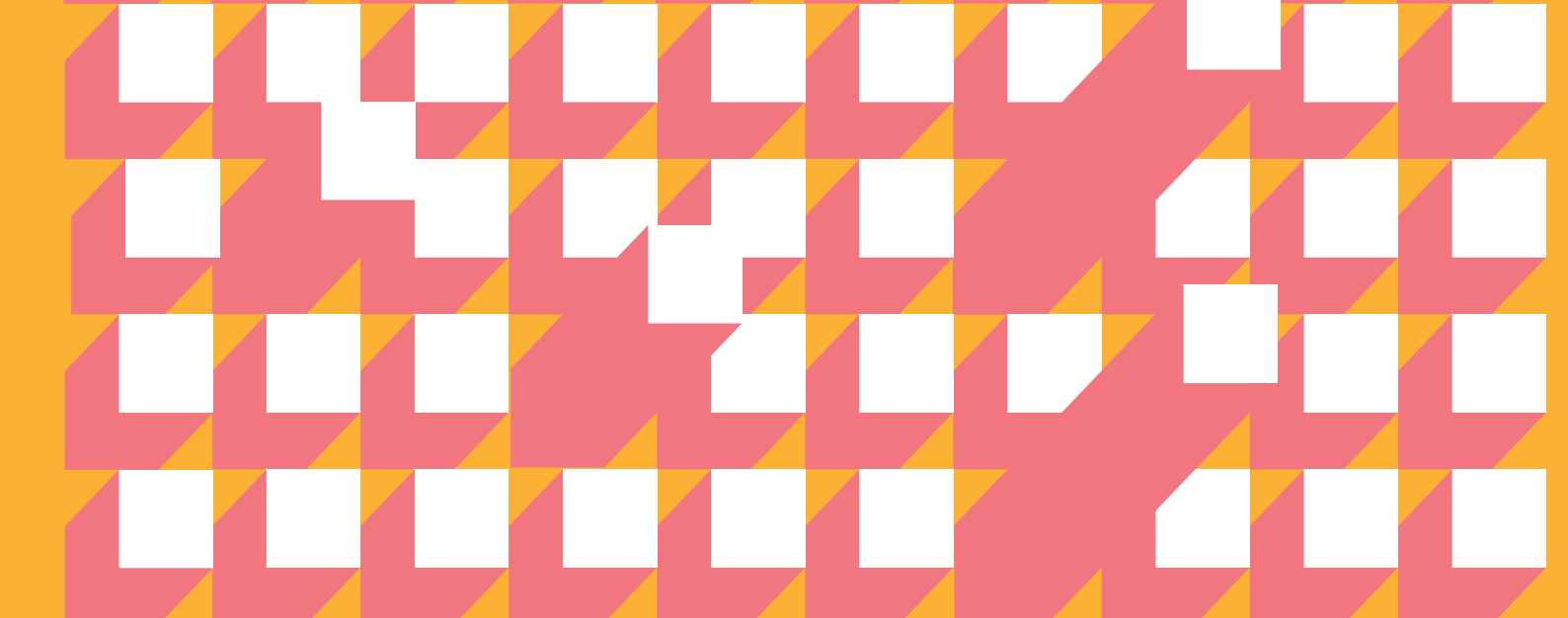
1 474 To non-STEM studies

Source: Platform Betatechniek, Tech your future, PwC analysis

17 Platform Betatechniek, 2017, Betatechniek in cijfers
18 Studies with STEM elements have either <50% STEM or >50% STEM
19 Platform Betatechniek, 2017, Betatechniek in cijfers

Small window of opportunity

Research indicates that students' attitudes towards arithmetic, mathematics, science and technology are an important predictor of their later choice of STEM studies[20]. In other words, an interest in STEM fields needs to be cultivated as early as in primary school.

Even subtle cues can affect what we believe is possible for ourselves. **Stereotype threat** suggests that various situational cues can lead us to confirm the negative or positive stereotypes about the social group to which we belong. Research shows that five to six-year-old children already have unconscious implicit stereotypical ideas about mathematics. Both boys and girls show behaviour that implies that men love mathematics more and are better at it than women, even if they do not openly believe there is a difference between the mathematical skills of boys and girls of their own age[20]. From the age of eight, the implicit stereotypical ideas become more explicit.

Various studies show that girls in the upper classes of primary school are already less interested in technology-related subjects and enjoy STEM less than boys, despite being as good at them. Girls – and women – are less confident and in some instances even avoid these subjects. As a result, female students are more likely to **underestimate their ability in maths and overestimate how good they have to be to succeed** in advanced maths courses.

Female students are in general more likely than male students to take test results as an indicator of their abilities and mastery of the subject. If their results are below their expectations, they appear to be more likely to develop a negative self-image in these areas and drop STEM courses, excluding themselves from a possible future in STEM domains at a young age.[21]

Even when female students perform better than their male peers in STEM studies, it is very likely that they have even higher scores on subjects related to reading comprehension, such as foreign languages. Students tend to choose a study based on the subjects they excel at. Many female students who outperform their male peers at STEM, but are even better at other subjects, tend to enter non-STEM studies.[22]

Nudge
- Provide feedback on how well girls are doing in STEM compared to other subjects. This can help update our potentially biased beliefs and allow us to reassess our performance. Furthermore, feedback can encourage the right people to participate in competitions – those most capable instead of those most overconfident. Frequent feedback has been shown to encourage women to compete.[23]

> **"The science classes young adolescents take in secondary education are taught primarily by male teachers, and it is often for the first time in their school career they have a male teacher. The new role models and their approach to science and teaching often appeals more to boys than to girls."**
>
> - Jan Willem Velthuijsen, PwC

20   VHTO, 2017. Vroege Stereotypering: Verslag van een Inventarisatie- en Interventiepilot
21   Seymour & Hewitt, 2000. Talking about leaving: why undergraduates leave the sciences. Boulder: Westview Press.
22   Stoet & Geary, 2018. The Gender-Equality Paradox in Science, Technology, Engineering, and Mathematics Education
23   Gray, 2012. Men are from Mars, women are from Venus: The classic guide to understanding the opposite sex.

Real-life applications stimulate girls' interest

A study by Microsoft has identified the key drivers which influence girls' interest in STEM-related subjects (see figure 2)[23]. Many girls are strongly motivated by real-life applications for tech capabilities that contribute to a better world. Having visible role models, such as teachers and parents with a STEM profile, also stimulates girls' interest in and confidence within STEM subjects.

Nudge
- Eliminate clues that trigger performance-limiting stereotypes. For example, move the tick boxes where candidates are asked to select their gender and ethnicity from the beginning to the end of a test.[25]

Lack of role models

A key factor influencing our chosen path is the presence or absence of **role models**.[26] Evidence across the public and private sectors shows that seeing female leaders changes perceptions, making women more confident that they, too, can serve in leadership positions and making men more accepting of women as leaders[27].

People need to see counter-stereotypical role models for beliefs to change, in leadership roles as well as in technology. Recent surveys by PwC have shown that only 22% of young adults in the UK and 11% of young adults in Germany could name a prominent woman in STEM.[28,29]

Figure 2. Factors driving girls' interest in STEM
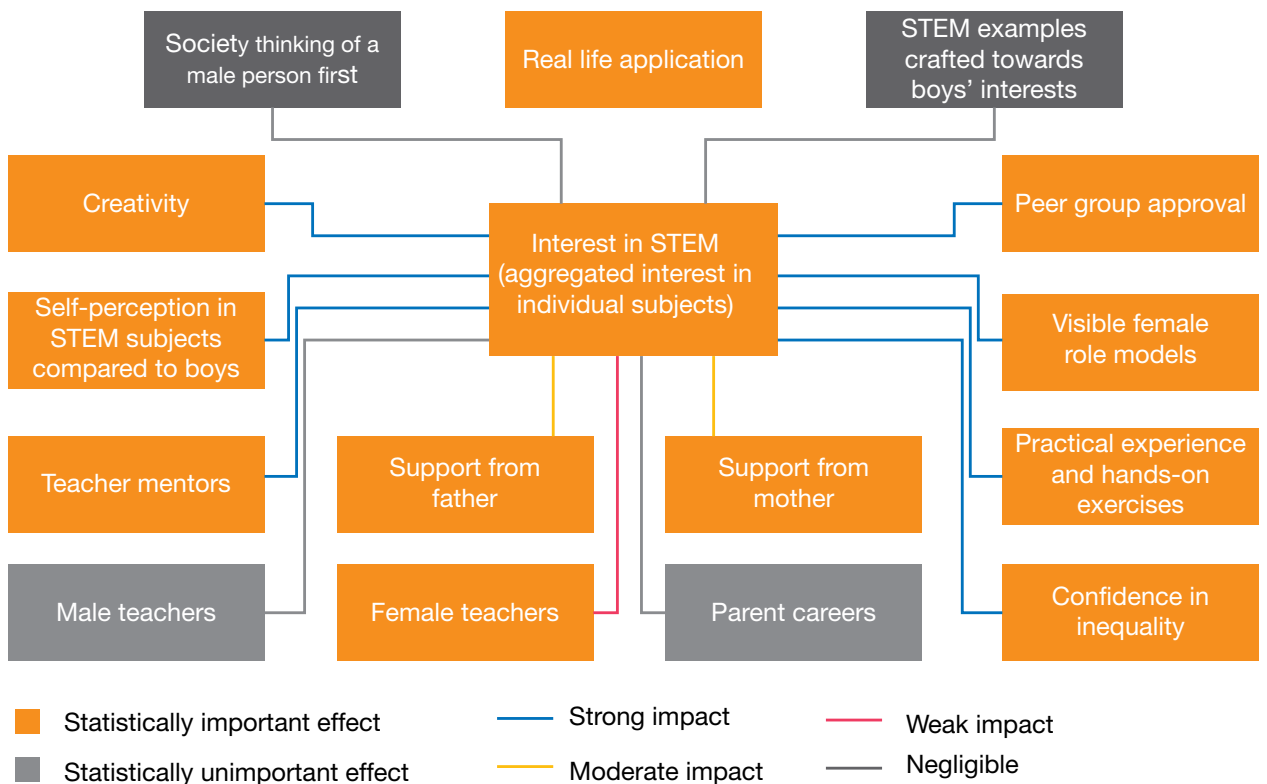
Source: Microsoft (2017) Why Europe's girls aren't studying STEM

24 Microsoft, 2017. Why Europe's girls aren't studying STEM
25 Eisenkopf et al., 2015. Academic performance and single-sex schooling: evidence from a natural experiment in Switzerland. Journal of Economic Behavior and Organization, Behavioral Economics of education 115: 123 - 143
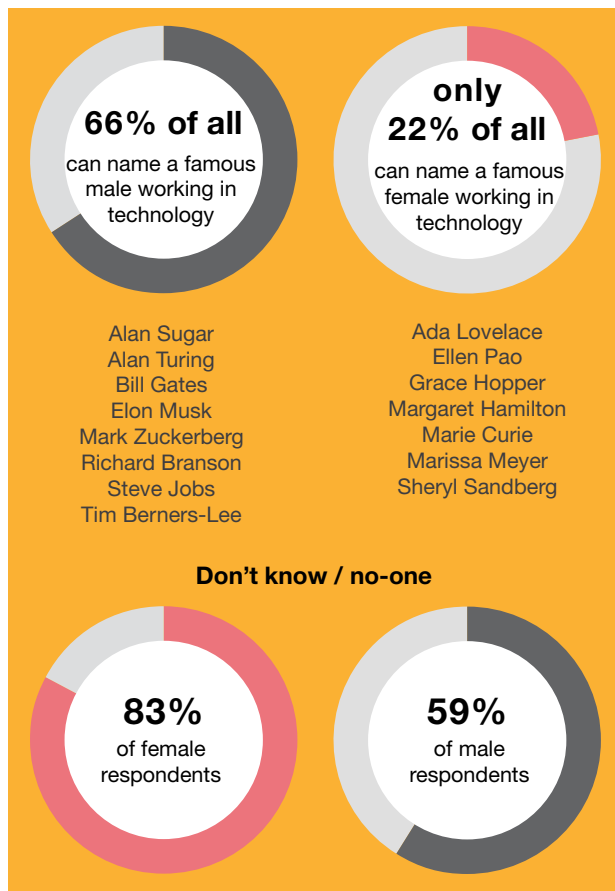26 Kahneman, 2011. Thinking fast and slow. New York: Farrar, Straus and Giroux
27 Beaman et al., 2012. Female leadership raises aspirations and educational attainment for girls: a policy experiment in India. Science 335: 582 - 586
28 PwC, 2017. Women in Tech: Time to close the gender gap
29 PwC, 2018. Women in tech report: Potenziale nutzen –Vielfalt stärken

Figure 3. Names young people in the UK came up with when asked who has inspired them to consider a career in technology

66% of all
can name a famous male working in technology

only 22% of all
can name a famous female working in technology

Alan Sugar	Ada Lovelace
Alan Turing	Ellen Pao
Bill Gates	Grace Hopper
Elon Musk	Margaret Hamilton
Mark Zuckerberg	Marie Curie
Richard Branson	Marissa Meyer
Steve Jobs	Sheryl Sandberg
Tim Berners-Lee	

Don't know / no-one

83%
of female respondents

59%
of male respondents

Source: PwC (2017) Women in Tech: time to close the gender gap

"The evidence is overwhelming that role models influence behaviour … and any woman in a position of prominence may choose to act as a role model."

- Iris Bohnet, Professor of Public Policy & Director of the Women and Public Policy Program at the Harvard Kennedy School

Nudge
- Role models matter from an early age, so show female STEM teachers, parents and others in counter-stereotypical roles. An initiative in which female maths teachers or engineers – as well as male nurses and male primary school teachers – speak to school children can be powerful in the formative years for both boys and girls[30]. In introductory STEM courses, female students were more likely to continue their studies in a STEM subject when assigned a female professor instead of a male professor. The faculty's gender had no effect on male students' choices[31].

Schools should be proactive in exposing young girls to tech capabilities. There are already many initiatives related to science, coding and programming, and events to connect students with tech professionals and companies. To make these initiatives more sustainable, the Dutch government is planning to incorporate digital skills in school curriculums as of 2019.

Additionally, behavioural design can help through de-biasing classrooms, changing how our children are taught, as well as through celebrating counter-stereotypical role models[32].

Nudge
- Students' attitudes can also be affected by subtle and simple changes such as diversifying the portraits on the walls of your organisations.

30 Forbes India, 2017. Removing workplace biases with 'behavioural design'. Available: http://www.forbesindia.com/article/rotman/removing-workplace-biases-with-behavioural-design/48945/1
31 Bettinger & Long, 2005. Do faculty serve as role models? The impact of instructor gender on female students. American Economic Review 95: 152 - 157
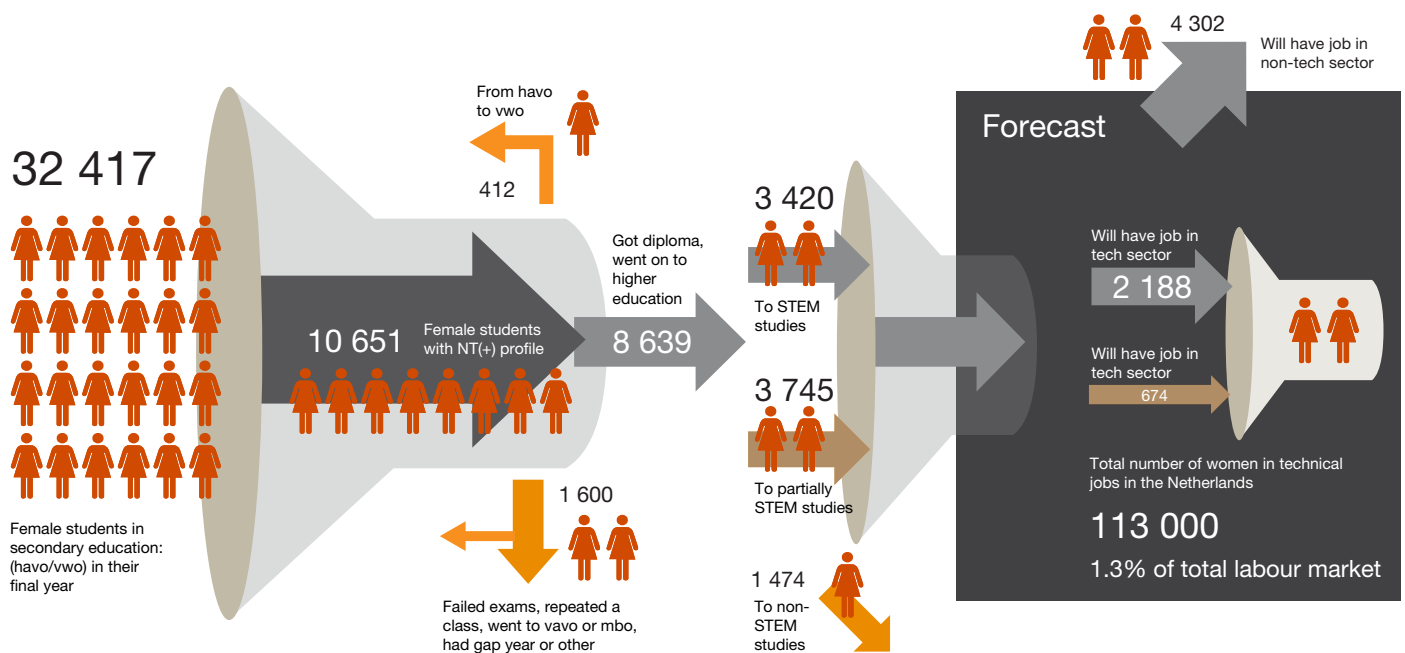32 Forbes India, 2017. Removing workplace biases with 'behavioural design'. Available: http://www.forbesindia.com/article/rotman/removing-workplace-biases-with-behavioural-design/48945/1

Women in tech: in and out?

When entering the labour market, only 40% of the female STEM graduates end up in the tech sector[33]. At 64%, this percentage is higher amongst female students who did a 'hard' technical study. Of the girls who did a partially technical study, only 18% started a tech job at a technical company[34]. Many women with a STEM background end up in technical jobs outside the tech sector, for example in the healthcare industry or a consultancy.

Figure 4. The STEM funnel forecast

32 417

Female students in secondary education: (havo/vwo) in their final year

From havo to vwo
412

10 651
Female students with NT(+) profile

Got diploma, went on to higher education
8 639

1 600
Failed exams, repeated a class, went to vavo or mbo, had gap year or other

3 420
To STEM studies

3 745
To partially STEM studies

1 474
To non-STEM studies

Forecast

4 302
Will have job in non-tech sector

Will have job in tech sector
2 188

Will have job in tech sector
674

Total number of women in technical jobs in the Netherlands
113 000
1.3% of total labour market

Source: Platform Betatechniek, Tech your future, PwC analysis

Hiring

Many companies do not harness the full talent pool available. Prevailing gender biases limit both men and women. **Gendered language** in job ads and other organisational communications can 'sort' applicants before they have applied[35,36].

Research shows that women found job advertisements for a management position describing a large number of qualities traditionally associated with men (such as 'assertive', 'independent' and 'analytical') less appealing and were less inclined to apply[37]. Women found words like 'dedicated', 'responsible', 'conscientious' and 'sociable' more appealing.

The same principle applies to jobs in emerging tech, where gendered language may discourage certain applicants, thereby denying firms the possibility of exploiting the full potential of the talent pool[38].

Our South African colleagues looked at a small sample of 20 job ads for 'data scientist/analyst' and 'UX/UI developer' positions in South Africa. They found 85% of the ads to be masculine coded, while only 10% were feminine coded and 5% neutral. This likely reflects the language used

33 Tech your future, PwC analysis
34 Tech your future, 2017. Factsheet Vrouwen aantrekken en behouden in de techniek
35 Bohnet, 2016. What works: gender equality by design, p. 163
36 Hentschel, T., Braun, S., Peus, C., & Frey, D. (2014) Wording of advertisements influences women's intention to apply for career opportunities.
37 Hentschel, T., Braun, S., Peus, C., & Frey, D. (2014) Wording of advertisements influences women's intention to apply for career opportunities.
38 Danielle Gaucher, Justin Friesen, and Aaron C. Kay: Evidence That Gendered Wording in Job Advertisements Exists and Sustains Gender Inequality (Journal of Personality and Social Psychology, July 2011, Vol 101(1), p109-28).

in emerging tech job ads in South Africa and represents a barrier women face in partaking in the emerging tech revolution, as well as throwing a spanner in the works for organisations looking to benefit from the full breadth of available talent.

> **Nudge**
> - **Purge gendered language from job ads and other company communications**. This is especially important as women consider more factors than men when screening jobs – in particular, cultural fit, values and managerial style. Research suggests that establishing a sense of belonging is a major concern for female job seekers.

> **Nudge**
> - First impressions also matter in recruitment sessions. In a study of staff recruitment sessions at a US university, only 22% featured female engineers talking about technical work. In the few sessions that featured women speaking on technical subjects in which they connected these issues to instances of real-world impact, female students were much more engaged, asking questions 65% of the time, compared with only 36% in sessions with no women speakers. **In other words, the importance of relatability extends across the platforms of recruitment activities, from job ads to recruitment events.**

Retaining women in tech

The hiring process is not the only obstacle women with a STEM background face when entering the tech sector; retention is another issue. Women leave the industry significantly earlier and more often than their male colleagues. The outflow is not only high compared to men working in the same sector, but also in comparison with technically educated women who started working outside the STEM sectors[39]. Research shows that several factors contribute to women leaving the technical sector early[40]:
- **Gender bias**: technical competencies of women are often underestimated, women are assigned less challenging tasks, their input is ignored or they face (sexual) intimidation.
- **Reduced sense of belonging**: women are missing support structures when excluded, or lack a sense of belonging in a male-dominated culture. Many women in tech experience unbalanced team environments, where they often find themselves as the only female with a tech background.
- **Home-centred lifestyle**: there is a prevailing belief that women are more responsible for caring than men and more likely to work part time.
- **Self-efficacy**: the professional self-confidence of women in tech is relatively low as a result of gender bias, lacking a sense of belonging and the home-centred lifestyle.

The relative numbers of socially and culturally different people in a team can be critical in shaping a team's dynamics[41]. In teams dominated by one social group, members of the minority group can become **tokens** among peers. Viewed as symbolic representatives of their social group, they may be hampered in contributing their full potential. The Norwegian professor of computer science, for example, becomes the go-to person on all things Scandinavian instead of an authority in their field of expertise[42].

Furthermore, women have been found to receive lower performance evaluations than men in teams where they represented less than 20% of the group. As their relative presence increased, so did the results of their performance evaluations[43].

Stereotypes lose their prominence in more balanced teams, and minority members in the team come to be seen as individuals and not simply as token representatives. Perfect equality is not required to change experiences and team performance; research suggests that a critical mass of one third in relative terms and at least three in absolute numbers is required to move teams away from tokenism and towards seizing the potential of diversity[44].

> **Nudge**
> - **Include a critical mass of women in teams to avoid tokenism**. When building teams, consider how to add complements and not substitutes. A diversity of viewpoints can trump average excellence when it comes to collective problem solving. Both ability and diversity are required to maximise collective intelligence[45].

39 Glass, J. L., Sassler, S., Levitte, Y. & Michelmore, K. M. (2013). What's so special about STEM? A comparison of women's retention in STEM and professional occupations. Social Forces, 92(2), 723-756

40 https://www.techyourfuture.nl/files/downloads/Nieuws/Infographic_2_vrouwen_behouden_voor_ICT.pdf

41 Kanter, 1977. Some effects of proportions on group life: skewed sex ratios and responses to token women. American Journal of Sociology 82: 965 - 990

42 Deguid, 2011. Female tokens in high-prestige work groups: catalysts or inhibitors of group diversification? Organizational Behavior and human decision processes 116: 104 - 115

43 Sunstein & Hastie, 2014. Wiser: getting beyond groupthink to make groups smarter. Boston: Harvard Business Review Press

44 Deguid, 2011. Female tokens in high-prestige work groups: catalysts or inhibitors of group diversification? Organizational Behavior and human decision processes 116: 104 - 115

45 Mannix & Neale, 2005. What differences makes a difference? The promise and reality of diverse teams in organisations. Psychological Science in the Public Interest 6: 31 - 55

Nudge
- **Change norms through smarter messaging:**
  - Celebrate successes in increasing gender diversity. Instead of describing the small fraction of female representation, focus messaging on the large fraction of companies with gender diverse leadership. This idea is rooted in 'herding'[46]. Descriptive norms, what many are already doing, turn into prescriptive norms, just by virtue of telling people about them. People are more likely to adopt a new behaviour if they know that many others are already doing it.
  - Sharing information about what others are doing might show laggards they are outliers. This can prompt renewed motivation to join the herd and forge a new norm. Through publishing rankings, for example, we can make public and visible how well a country or company is doing and ultimately promote convergence on the target.
  - Rules and codes of conduct mirror social norms. Learning about what is allowed or disallowed through rules and codes of conduct indicates society's norms and expresses society's view of what forms acceptable behaviour – a powerful cue that can help break down barriers to female representation.

> "We see that when companies invest in a more inclusive culture they become a more sustainably attractive workplace for women. Our behaviour, messaging and ways of attracting all impact the experience of women in the organisation. Speak up for them..."
>
> - Terence Guiamo, PwC Diversity Office

In-career development and progression

Gender differences in self-confidence are not only a concern in school and higher education, but also in performance appraisals. Many firms ask their employees to evaluate themselves and then share these self-evaluations with their supervisors. Self-assessments entrench gender biases through anchoring, where women will generally underrate their performance, which serves as an unconscious, low, reference point for evaluators[47].

Nudge
- **Do away with self-assessments wherever possible**, or at least avoid sharing self-assessments with evaluators ahead of performance reviews.

Human resource managers and others responsible for personnel decisions may perceive women asking for better compensation as **violating gender norms**. Research suggests that when we do not find women to be agreeable and communal, and they therefore violate social norms, we prefer not to work with them. Women, consequently, are less likely to negotiate than men; if they do, they are at risk of a social penalty. When women do negotiate on remuneration, they also ask for less[48].

In a field experiment, researchers Andreas Leibbrandt and John List published two different job ads in nine big US cities. One ad suggested that wages were negotiable, while the other ad was ambiguous regarding wages. Male and female job seekers responded differently to these ads. Men were more likely to apply for jobs when it was left unclear whether wages were negotiable.

Men arguably were more comfortable with this ambiguity, potentially because they expected themselves to do well in situations where negotiations were not specifically called for. In these instances, male job seekers were also more likely to negotiate than their female counterparts. Women were more willing to negotiate when the ambiguity was removed and the ad 'invited' them to negotiate. Given the negotiation dilemma women face, external legitimisation helps them overcome the social hurdle in negotiating compensation[49].

In our survey of 3,600 professional women, 63% of the women who had been promoted in the previous two years had negotiated for that promotion. Furthermore, of the 53% and 52% of women who had been given a high-visibility project or stretch assignment in the past two years, 91% and 86% had negotiated for these opportunities. Self-advocacy can pay off, especially when support from advocacy and support programmes helps legitimise self-promotion until it becomes a new social norm[50].

46 Gerber & Rogers, 2009. Descriptive social norms and motivation to vote: everyone's voting and so should you.
47 Paustein-Underdahl et al., 2014. Gender and perceptions of leadership effectiveness: a meta-analysis of contextual moderators. Journal of Applied Psychology 99: 1129 - 1145
48 Save-Soderbergh, 2007. Are women asking for low wages? Gender differences in wage bargaining strategies and ensuing bargaining success. Available: http://www.sofi.su.se/polopoly_fs/1.65025.1323949620!/WP07no7.pdf
49 Leibbrandt & List, 2014. Do women avoid salary negotiations? Evidence from a large-scale natural field experiment. Management Science 61: 2016 - 2024
50 PwC, 2018. Time to talk: what has to change for women at work. Available: www.pwc.com/timetotalk

> **Nudge**
> - **Invite team members to speak up and explicitly invite negotiations**. Legitimise negotiations about promotion and salary raises by enabling people to negotiate on behalf of others.

Leadership

As previously mentioned, women in unbalanced team environments can suffer from tokenism. This can result in the queen bee syndrome – the lonely woman at the top. Rather than eliminating barriers for women following her, as a token member she may look to her majority peers, assimilate, and distance herself from new women entrants. This is particularly common among first-generation women in counter-stereotypical roles[51].

Evidence from Norway and the US suggests that senior managers are important corporate role models. When the share of female top managers increases, research suggests that the share of women in mid-level management also rises[52]. The more visible female leadership is, the more likely the positive effects.

In relation to female leadership, '**seeing is believing**'[53]. Since Susan Wojcicki became CEO of YouTube in 2014, the number of women in the employ of YouTube increased from 24% to 30%[54].

51   Drexler, 2013. The tyranny of the Queen Bee. Available: https://www.wsj.com/articles/SB10001424127887323884304578328271526080496
52   Bertrand et al., 2014. Breaking the glass ceiling? The effect of broad quotas of female labor market outcomes in Norway. Available: http://ftp.iza.org/dp8266.pdf
53   Bohnet, 2016. What works: gender equality by design. England: Belkap Press, p. 210
54   Forbes, 2017. Meet America's richest self-made women in tech. Available: https://www.forbes.com/sites/katevinton/2017/05/17/meet-americas-richest-self-made-women-in-tech/#6b94db115a94

Building the workforce of the future

> "Governments should engage with organisations developing the use of robotics and AI … to create a pool of thought leaders with a deep understanding of the interplay between technology and its effect on society."
>
> - PwC Workforce of the Future[55]

There is no doubt that the world in which we live is changing, and fast. PwC's 2017 report "Workforce of the future: The competing forces shaping 2030" deciphers what our workforce might look like in the near future. The report envisions the future through four distinct lenses[56]. Despite their differences, each perspective is influenced by the theme of automation and the implications of robotics and AI. Technology, automation and AI will upset traditional ways of doing business in all sectors. Awareness and understanding of the changing technological landscape can help companies survive and thrive.

To remain relevant, businesses will need to have a clear strategy to attract and retain the right employees, customers and partners. Increasing the number of women graduating in STEM fields is critical to enhancing the talent pool available to governments and businesses alike.

Furthermore, to help plug the leaky pipeline of women leaving their tech careers, hiring processes must shift to allow talent to speak for itself. Getting more women into boardrooms would broaden viewpoints and improve outcomes. Indeed, 80% of surveyed women working in tech are determined to seek out opportunities to advance their careers.[57]

Nudges are powerful weapons in the armoury available to an organisation that wishes to advance female careers in tech. Companies can embrace insights from behavioural design to increase female interest in tech and attract more girls and women. Moreover, society as a whole would benefit hugely if as many girls as boys chose a STEM profile in secondary education, and if we could lead more women towards tech jobs in technical environments and keep them there. This would double our technological capabilities at a stroke. To increase the tech potential in our labour market and thrive in the digital age, we need as many people with tech capabilities as possible.

55   PwC, 2017. Workforce of the future: The competing forces shaping 2030. Available: https://www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf
56   Ibid.
57   PwC, 2018. Time to talk: what has to change for women at work. Available: www.pwc.com/timetotalk
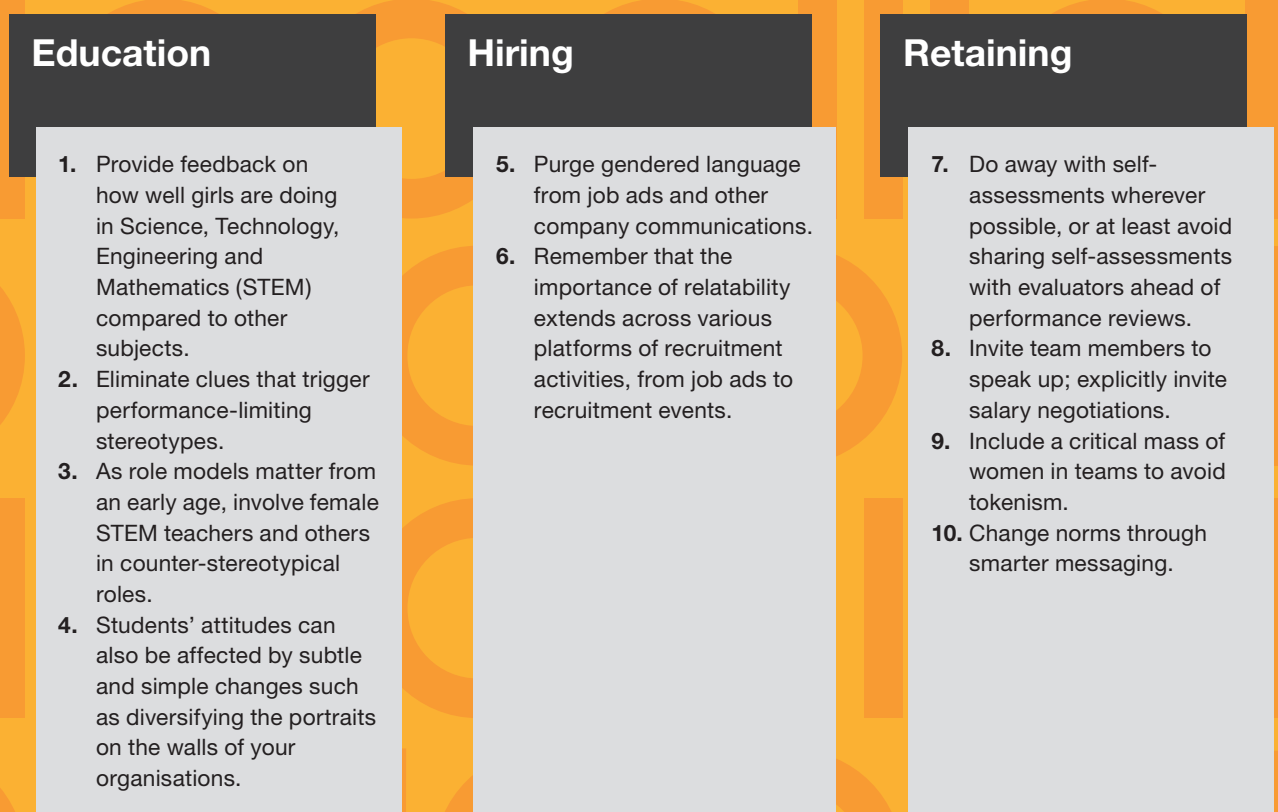
To accomplish this, we need teachers, educational leaders, managers and HR professionals to create a STEM environment where girls and women feel comfortable, confident and accepted. Adopting and implementing these nudges would help us create a more female-friendly tech environment.

The responsibility for openness to change and reinvention does not lie exclusively with businesses, but also with each individual. If we believe the future lies in STEM, we must **train ourselves and our daughters** in the relevant skills. If we have an interest in robotics, we must become acquainted with the foundations. Whatever our profession, let us rethink the way we apply our capabilities in light of how work is likely to be done in the future.

Figure 5. Ten nudges for more women in tech

Education

1. Provide feedback on how well girls are doing in Science, Technology, Engineering and Mathematics (STEM) compared to other subjects.
2. Eliminate clues that trigger performance-limiting stereotypes.
3. As role models matter from an early age, involve female STEM teachers and others in counter-stereotypical roles.
4. Students' attitudes can also be affected by subtle and simple changes such as diversifying the portraits on the walls of your organisations.

Hiring

5. Purge gendered language from job ads and other company communications.
6. Remember that the importance of relatability extends across various platforms of recruitment activities, from job ads to recruitment events.

Retaining

7. Do away with self-assessments wherever possible, or at least avoid sharing self-assessments with evaluators ahead of performance reviews.
8. Invite team members to speak up; explicitly invite salary negotiations.
9. Include a critical mass of women in teams to avoid tokenism.
10. Change norms through smarter messaging.

PwC contacts and credits

Angeli Hoekstra
Partner

T: +31 88 792 25 17
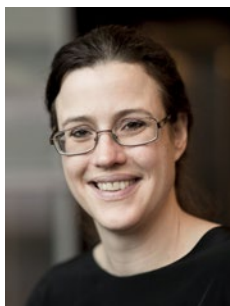E: hoekstra.angeli@pwc.com

Suzanne Keijl
Partner

T: +31 88 792 35 17
E: suzanne.keijl@pwc.com

Jan Willem Velthuijsen
Chief Economist

T: +31 88 792 75 58
E: jan.willem.velthuijsen@pwc.com

Marc Borggreven
Member of Dutch Board of
Management, responsible for Human
Capital

T: +31 88 792 44 89
E: marc.borggreven@pwc.com

Anita Hagen
Researcher Chief Economist Office

T: +31 88 792 50 69
E: anita.hagen@pwc.com

Thank you to the PwC experts who contributed to this report: Lullu Krugel, Maura Feddersen, Nina Kirsten (Economists at PwC Strategy& in South Africa) and Henrieke Oonincx.

pwc