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Women in the Digital Space (and AI): Looking into Central Europe:

Cases from Austria, Czechia, Poland, and Slovakia

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The CEE Her Initiative, powered by GLOBSEC, aims to amplify expert female voices in influential policy-making debates. The goal is also to create a public resource for conference organisers, think tanks, non-profits and public institutions to find women experts from and interested in the Central and Eastern Europe+ region for their panels, articles and discussions and to bolster a creation of a vivid network of female experts who seek more diverse debates and can provide a valuable perspective on contemporary societal issues. Through this initiative, GLOBSEC strives to contribute towards a more comprehensive goal of changing narratives and policies in CEE+ where gender equality can lead to more stable, secure, and prosperous region.

Executive Summary

The 'Women in the digital space (and AI): Looking into Central Europe' report aims to examine whether women in Central Europe (CE) are benefiting from digitalisation (and AI), namely in their use of the digital space and their participation in building it. The study comparatively tracks both the challenges and opportunities with respect to women's (potential) engagement with this emerging field. Scrutinising Austria, Czechia, Poland and Slovakia, the report advances a series of recommendations for forging a more inclusive and equitable digital landscape. Furthermore, the report complements current discussions on the digital transformation and the emergence of AI technology by providing a regional gender perspective.

This report was supported by observational fieldwork based on the social media interactions of 20 prominent women and 10 interviews with successful women practitioners in the digital field from Austria, Czechia, Poland and Slovakia. The following ***main findings*** *are spotlighted:*

Women as Users of the Digital Space

- In CE, women use social media to a greater extent than men. They are, however, notably less active on platforms related to professional development (e.g. LinkedIn).
- Women from CE are using differently digital services such as e-government, e-banking, e-commerce, or online learning, with many trailing men in digital skills and literacy.
- Gendered cyberviolence and sexist hate speech are prevalent and often experienced by women users of social media. In the CE region, comprehension of the full scope of cyberviolence is still sorely needed.
- Women in politics are subjected to the highest volume of negative reactions by a significant margin.
- Tracing indicators pertaining to the use and the building of digital spaces (and AI) often lack granulated gender-disaggregated data that is up to date.

Women as Creators/ Architects of the Digital Space

- In CE, women are underrepresented in the digital industry and AI to a much greater extent than in STEM fields in general, with this trend beginning in higher education.
- The region is struggling with a severe gender pay gap in the digital field.
- The significant shortage of specialists presents a window of opportunity for women to enter the industry and do it under better conditions.
- Persistent gender stereotypes and a lack of role model visibility are detrimentally influencing the career decisions of girls and women on whether to enter the industry.
- Investment in women-led startups continues to be miniscule.
- Numerous notable women's initiatives now provide comprehensive skilling, re-skilling, and up-skilling services and have invested in creating an environment for mentoring and leadership support.
- Potential exists in the region for women to equally contribute to cutting-edge new technologies, pending the strengthening of the support ecosystem.

Challenges for women in the digital space are notable from gender-based cyberviolence to reinforcement of biases, a lack of truly comprehensive digital skills and literacy, underrepresentation in the industry, an absence of role models, and a glaring gender pay gap. Nevertheless, the digital transformation holds real potential in the region, if notable opportunities and best practices are leveraged. This includes the momentous opportunity for entry into the digital field amid gaping talent shortages, inherently flexible work environments, the existence of bottom-up support initiatives to skill and mentor women, and the potential to resolve social challenges (often from women to other women).

At present, women in the CE do not fully benefit from the digital space. This report puts forward concrete recommendations that can be implemented at various stakeholder levels. These encompass protections for women users of the space, an emphasis on digital education, the implementation of creative solutions for (re)attracting women to the field, the strengthening of coordination among educational, mentoring, and support initiatives, the development of consultation channels with women for AI solutions, and the collection of granulated data in the digital space.

Introduction

"From a technological standpoint, the field is wide open; the obstacles are not in the technology itself but in the ecosystem surrounding it."

Estera Kot, Principal Product Manager at Microsoft, Poland

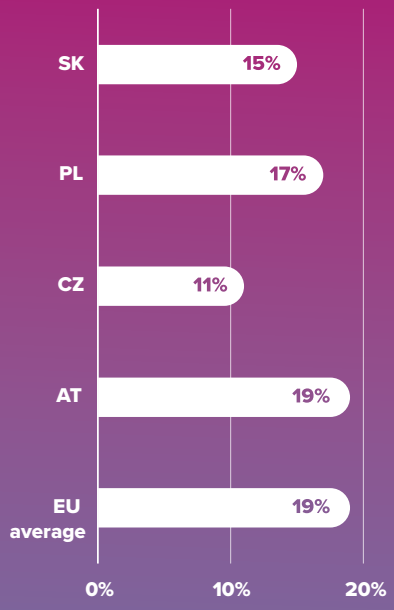
The exponential technological development poses both opportunities and challenges for women in CE as it permeates all aspects of everyday life. Understanding the rules of the digital space, both as users and as its shapers, has become a matter of necessity rather than merely desirable. Ensuring women's equal participation and inclusion in the ongoing digital transformation would considerably contribute to building a better society.

The digital ecosystem remains primarily dominated by young white men. Only 19% of Information and Communications Technology (ICT) specialists in the EU are women[1], constituting a mere 2% of all EU employment, compared to 7% for men.[2] Across Central European countries, the percentage of women specialists in ICT varies, with 19% for Austria, 11% for Czechia, 17% for Poland and 15% for Slovakia.[3] These numbers may fall further if granulated into non-programming areas of work like HR, marketing, and project management. Most strikingly, women in ICT earn on average 19% less than their male colleagues, exceeding the EU gender pay gap of 13%.[4] In the analysed CE countries, the disparity is even wider, ranging between 20% and 30%.[5]

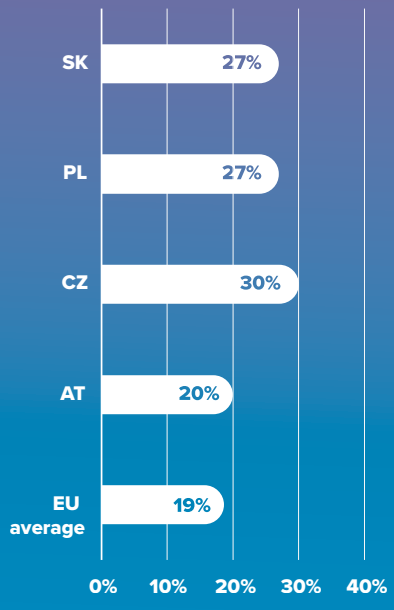
This **lack of diversity** in architecting new digital technologies **leads to biased (AI) outputs,** trained on non-representative data, resulting in products that fail to meet the needs of women. For instance, Amazon's recruiting tool dismissed women's applications[6] and an algorithm used by the Dutch tax authorities falsely accused thousands of individuals of fraud, perpetuating racial and gender profiling.[7] Meanwhile, an algorithm for the Public Employment Service of Austria disadvantaged women and older jobseekers.[8] Despite advancements in technology, entrenched social norms and gender stereotypes persist, perpetuating inequality.

Though women remain underrepresented, it is not necessarily due to hiring discrimination or the glass ceiling effect, as seen in fields such as politics, media, and business. There are rather **too few women with the necessary skills** to enter the digital field in the first place. While the percentage of female STEM graduates across the entire EU stands at 33%, the picture is mixed for CE, with Austria at 28%, Czechia at 27%, Poland at 42% and Slovakia at 34%.[9] A critical factor lies in the career fields women choose to pursue after graduation, with too few opting for jobs in digital oriented sectors. Indeed, only 1% of school-

Women specialists in ICT



Gender pay gap in the digital field



1 https://ec.europa.eu/eurostat/statistics-explained/images/0/05/Distribution_of_persons_employed_as_ICT_specialists_2012_and_2022_%28%25%29.png
2 https://digital-strategy.ec.europa.eu/en/policies/desi
3 https://ec.europa.eu/eurostat/statistics-explained/images/0/05/Distribution_of_persons_employed_as_ICT_specialists_2012_and_2022_%28%25%29.png
4 https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/equal-pay/gender-pay-gap-situation-eu_en
5 https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021
6 https://www.businessinsider.com/amazon-ai-biased-against-women-no-surprise-sandra-wachter-2018-10
7 https://www.amnesty.org/en/documents/eur35/4686/2021/en/
8 https://www.derstandard.at/story/2000114974300/ams-algorithmus-forscher-warnen-vor-diskriminierung-und-be-maengeln-fehlende-transparenz
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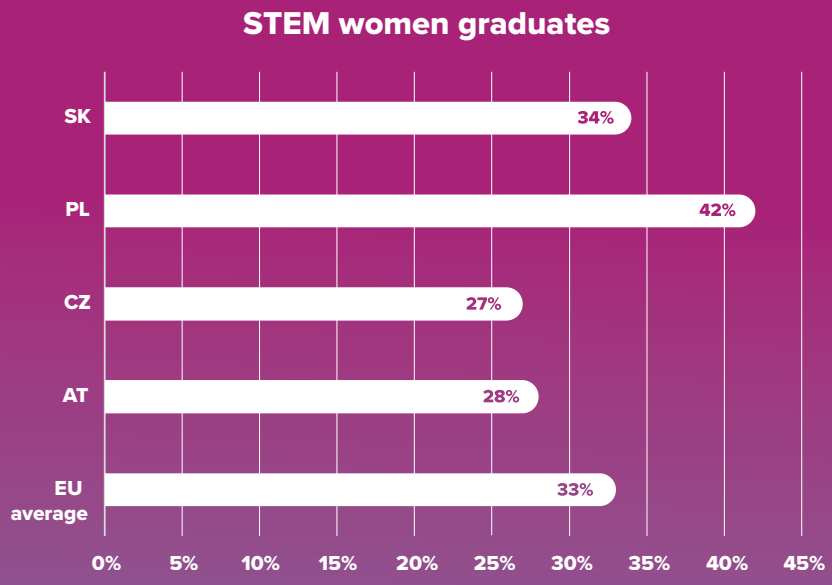
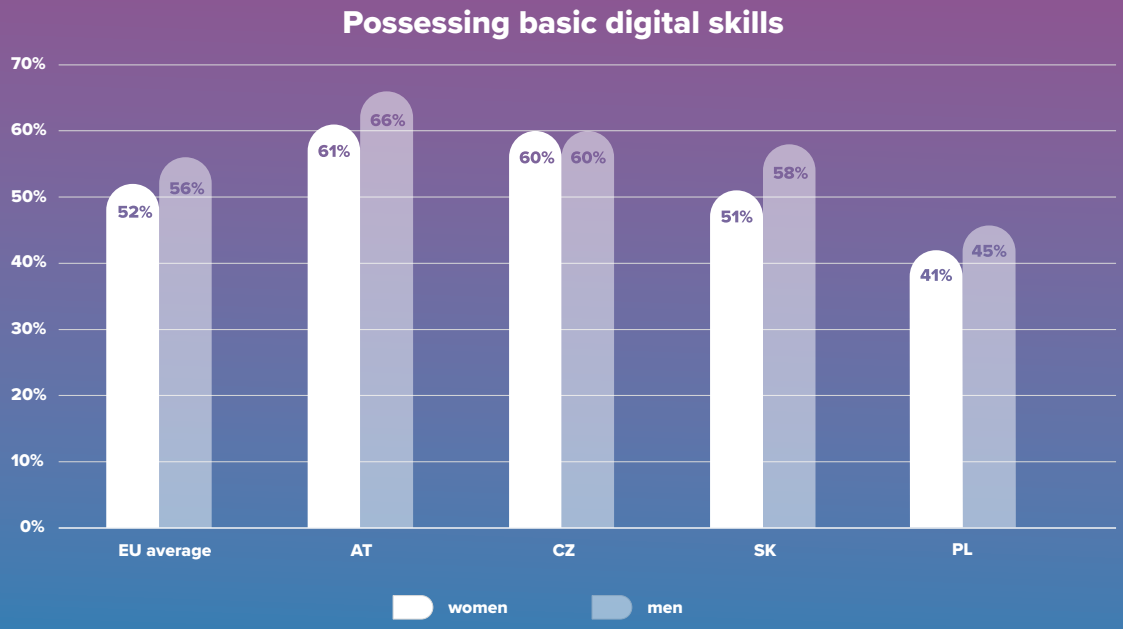




aged girls in the EU express interest in working in digital fields in the future, compared to 10% of boys.[10]

Furthermore, if women are to influence technological advancements and AI effectively, they must be involved from the outset as co-founders and investors. "By founding or joining startups at early stages, women can have an active role in shaping the product."[11] However, only 15% of startup founders in the EU are women.[12] Moreover, women-led startups receive **strikingly less funding.** All-male teams, in fact, gather around 94% of capital invested in the CEE region, with 1-2% going to all-female teams. While funding to female-led teams remains minuscule, women-founded startups generate more revenue per euro invested and outperform all-male-led teams in capital productivity by 96%.[13]

Moreover, the **industry sorely needs talent,** with EU labour shortages presently amounting to more than 700,000 specialists in the digital field.[14] This backdrop, nevertheless, provides an enormous window of opportunity for women and girls to (re)shape the digital landscape, if the opportunity is promptly seized.

10 https://ec.europa.eu/eurostat/databrowser/product/page/educ_uoe_enrt03
11 Interview with Alicja Kwaśniewska, Senior Principal ML Architect at SiMa.ai, Poland/USA
12 https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739380/EPRS_ATA%282023%29739380_EN.pdf
13 https://ceereport2021experiorvc.unconventional.vc/2/
14 https://eige.europa.eu/publications-resources/toolkits-guides/work-life-balance/women-in-ict?language_content_entity=en

Absent a diverse workforce, meanwhile, it will become ever more challenging to reverse inequality in this high-paced field.

Women require increased support to become architects of the digital space and **enhance their overall digital literacy.** The digital revolution is transforming daily lives at an unprecedented rate. Women now spend a considerable portion of their lives online "for communication, education, entertainment, work, activism, and self-expression. They also use AI tools to enhance their digital experiences, such as for voice assistants, chatbots, social media algorithms, and online learning platforms."[15] Therefore, a solid grasp in digital literacy is essential. In the EU, 52% of women and 56% of men boast at least basic digital skills.[16] The numbers vary in the analysed CE countries, from 61% and 66% respectively in Austria to 60% for both women and men in Czechia, 41% and 45% in Poland and 51% and 58% in Slovakia. By becoming conscious users, women will be able to not only skilfully navigate the digital space but also better advocate for their digital rights and demand lasting improvements.

The digital space tends to largely mirror or even reinforce trends present in the offline world, engendering both beneficial and detrimental effects on women. On the one side, women are more fervently tapping into opportunities for online learning, remote work, the promotion of their business ideas, and direct engagement with their target audiences, thereby circumventing existing business hierarchies. Moreover, victims have gained a channel for their voices to be heard. The #metoo movement, for example, would have struggled to gather global momentum without social media (use of a digital tool). Such instruments are also essential for mobilising women behind shared causes. Social media, for instance, played an integral role during nation-wide demonstrations against a restrictive abortion law in Poland.

On the other side, algorithms frequently replicate and reinforce existing biases which can impact women's self-perceptions. When legal frameworks fail to keep pace with tech, threats can take root. Pervasive cyberviolence represents one such issue that has been inadequately addressed and combatted by national legislation across numerous countries. Online disinformation, which can exploit new technologies to proliferate, further epitomises the severe challenge that societies now face. Furthermore, low digital literacy exacerbates cybersecurity concerns. Women often use "free" apps to track their periods or monitor pregnancies without being fully aware of what happens to their sensitive data.

Notably, some strides have been made in ensuring that the digital space facilitates the building of better societies. For example, the recent commitments made by the EU via the AI Act, in addition to the Digital Services Act, underline the precedence the bloc is placing on the sector and associated issues.

The digital space resembles a knife. It can be used to slice bread or inflict harm. While it holds the potential to empower women, it also risks widening existing divides. Women currently enjoy a unique opportunity to enter and shape this field, but the window of opportunity will not be open for eternity. For women's potential to be timely realized either as architects in the digital field or successful users, they require a complex range of support measures to be able to mitigate serious existing challenges and embrace sustained opportunities. If done right, it will be a win-win for all.

15 Interview with Katerina Magnna, Co-founder of the Czech Women AI Network, (CWAI) and Government Affairs Lead at Microsoft Czech Republic, Slovakia and Hungary
16 https://digital-strategy.ec.europa.eu/en/policies/desi

Women in the digital space. Country perspectives

Try to change from being a user to being a creator. Being a user is great, but it still has a lot of limitations. Being a builder, a creator, is amazing because we can break through all the boundaries.

Petra Kotuliaková,
Founder of Aj ty v IT, Slovakia

Austria

The Case Study: Austria

The five women monitored in the Austrian case were Karoline Edtstadler, Alma Zadić, and Susanne Raab (all involved in politics) as well as Valentina Höll (a professional athlete) and Valerie Huber (a musician and activist for climate and women's issues). These women were chosen not only due to their relatively active posting schedule on Instagram, but also due to their professional capacity or activism. Höll and Huber are outspoken women in an age group which, in Austria, is particularly impacted by online hate.[17] Edtstadler and Zadić represent different political perspectives, but as women, could face similar societal barriers to acceptance as experts and leaders in Austrian politics. As Minister for Women, Family, Youth, and Integration, Raab could potentially be expected to post more extensively on women's issues. While 54% of Instagram users in Austria are women,[18] the platform does not appear to be a primary area for discussion among Austrian users. Despite each monitored account increasing in followers throughout the course of the monitoring period, overall engagement was not high. Nonetheless, some patterns emerge.

Despite Höll's follower count being the greatest by far (168K, followed distantly by Huber at 52.2K), Edtstadler's page generated the most engagement, with her follower count increasing by at least several hundred per day. The rapid growth of Edtstadler's following appeared to correlate with her recent political decisions to collaborate more with somewhat different politicians (or issues) ideologically. This not only boosted her follower count but increased the controversy associated with her posts, where the average proportion of 44% negative comments outweighed the positive (42%), with 14% neutral or irrelevant comments. This same development was not observed for the other four women, whose pages boasted more or significantly more positive comments than negative on average. Huber, namely, garnered a 86% approval rate.

Generally, the **politicians received more negative comments** throughout the one-week monitoring period. While Raab and Zadić received an average of 14 such comments over the seven day study, the average stood at 4 for Höll and Huber.[19] Additionally, the nature of the negative comments differed. Both Höll and Huber were subjected to a greater proportion of sexually objectifying comments than the others, which reinforces data showing that young women are likely to more often receive **unwanted sexual comments.**[20] The greatest proportion of hate comments faced by the three politicians, on the other hand, fell into the **ideology** category, with 41% of negative comments for Edtstadler and 31% of negative comments for Raab (e.g. comments decrying or harshly questioning their party affiliation). Some ideologically motivated comments also included references to the women's appearance or choice of attire. Zadić's commenters seemed generally more amicable, generating the lowest proportion of negative comments of the three politicians as well as the lowest volume of negative comments questioning her **competence** (at 7%), compared to Raab's 8% and Edtstadler's 15%.

Women as Users of the Digital Space

In Austria, most people are connected to the internet (96%),[21] with the average time spent online standing at 5.5 hours daily.[22] Across all age groups, women use social media to a greater extent than men, and female social media user identities make up 51% of the total in Austria, constituting a slight majority which is consistent with demographic data. Female users also constitute the majority on Facebook (51%), YouTube (51%), Instagram (54%), Facebook Messenger (53%), Snapchat (50%), and Pinterest (72%). Austrian women, however, are the minority on Linkedin (42%) and Twitter/X (31%).[23]

17 https://www.weisser-ring.at/wp-content/uploads/2018/10/Broschuere-Gewalt-im-Netz.pdf - while teens are the most impacted by online hate, women between 19 and 34 in Austria are still more likely to face online hate than older age groups.

18 https://datareportal.com/reports/digital-2024-austria

19 Edtstadler's total negative comments are considered an outlier in this comparison and therefore not included – while the other politicians receive 14 negative comments per week on average, Edtstadler can receive up to 15 per day.

20 https://www.weisser-ring.at/wp-content/uploads/2018/10/Broschuere-Gewalt-im-Netz.pdf

21 https://datareportal.com/reports/digital-2024-austria

22 https://de.statista.com/themen/2876/internetnutzung-in-oesterreich/#topicOverview

23 https://www.europarl.europa.eu/RegData/etudes/STUD/2023/743341/IPOL_STU(2023)743341_EN.pdf

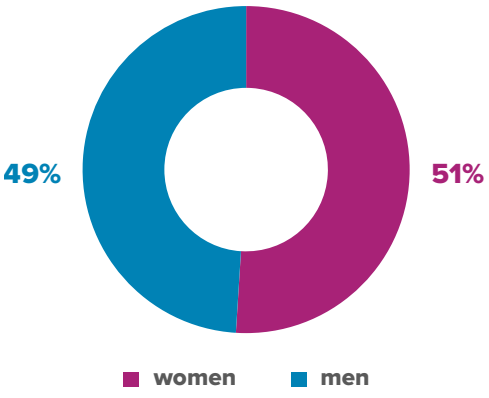
While women in Austria (26%) are keener than men to participate in online learning (22%) in other e-services women fall behind in use, although with a small margin. Overall the use of the services is high. For e-banking 75% of women are users, whereas men stand at 79%. In a similar fashion 77% of women in Austria use e-government services, while men exceed in use by extra 3% (total of 80%).[24]

Women as Architects of the Digital Space

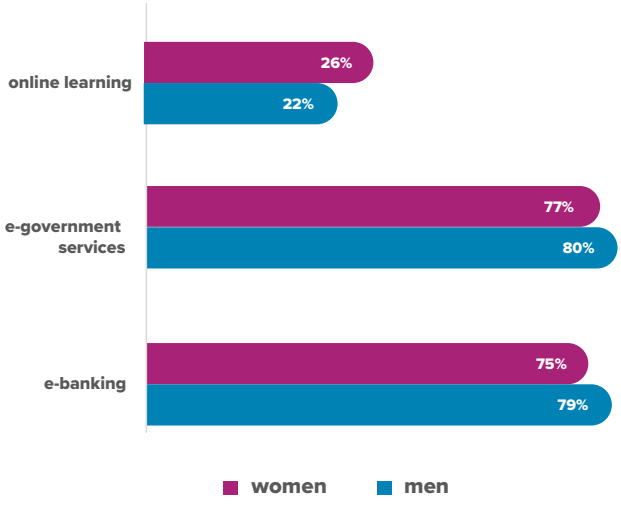
While 61% of women in Austria possess at least basic digital skills and 64% basic software skills, such competences across higher expertise levels are reported to be lower for women than men (29% for women and 38% for men).[25] For every female STEM graduate in Austria, there are roughly two male STEM graduates (28% female graduates)[26]. The gender gap among ICT specialists is even more extreme, with women ICT specialists comprising only 2% of all female labour force participants and the corresponding figure for men at 7%.[27] Female university students enrolled in technical programmes make up only about 30% of all students in such programmes.[28]

The gross value added of the digital sector in Austria is around 26.4 billion eur, which corresponds to 7% of Austria's overall economy.[29] The industry makes up around 234,000 jobs in Austria. However, in 2022, there were only 26,470 active female IT Service professionals employed, comprising only about 30% of the total labor force in this specific sector.[30] The gender divide for IT Service trainees was even more extreme, with women representing only 18% of such positions. Further, the gender pay gap in the industry is notable at 20%.[31] Despite gender inequalities in ICT (both in professional terms and digital skill level) decreasing between 2012 and 2019, a 2020 study examining digital problem-solving capabilities in the Austrian population found that more women occupy the lower quartiles of digital proficiency than men. Additionally, the population of male coders grew by 13% in this time period, while the female share only grew by 1%, reinforcing the idea that coding is not only seen as a male-dominated activity in Austria – it is one.[32]

Use of social media in Austria



Use of digital services in Austria



24 https://digital-strategy.ec.europa.eu/en/policies/desi
25 https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021
26 https://op.europa.eu/webpub/eac/education-and-training-monitor-2023/en/country-reports/austria.html#:~:text=Figure%202%3A%20Gender%20gap%20(women,and%202022%20(percentage%20points%20difference)&text=The%20gender%20gap%20in%20STEM,and%20in%20Austria%20only%2028%25.
27 https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021
28 https://www.bundeskanzleramt.gv.at/agenda/frauen-und-gleichstellung/gender-mainstreaming-und-budgeting/gender-daten-index.html
29 https://www.report.at/telekom/19184-frauen-in-der-it
30 https://www.wko.at/statistik/extranet/BeschStat/at12-fv-gk-ic.pdf?_gl=1*1oq9qgz*_ga*MTMyNzY5NDI5Ny4xNzA5MDQzNzg3*_ga_TJBEG291F0*MTcwOTA0Mzc4NC4xLjEuMTcwOTA0MzgzNC4wLjAuMA..
31 https://digital-strategy.ec.europa.eu/en/policies/desi
32 https://www.sciencedirect.com/science/article/pii/S0160791X20303249

Czech Republic

Women as Users of the Digital Space

Social media presence is equal between Czech women and men at 50%.[33] Facebook is the most preferred platform overall for Czech social media users at 65%, followed by Instagram with 34%. Women have prevalence in Facebook (53%), Instagram (54%) and TikTok (57%).[34]

When it comes to basic digital skills in Czechia, no gender gap is apparent, with proficiency at 60% for both women and men. However, men represent a higher percentage of those with above-basic digital skills (26% compared to 22% for women). As far as use of digital services is concerned, women are more active at 79% to 72% for men in terms of e-government use, 83% for women to 81% for men for online banking use, and 21% for women to 19% for men in online learning.[35]

Conversely, data on general AI use among Czech citizens shows that men use AI more often than women. While 35% of men reported using generative AI (such as ChatGPT or Bard) in the past year, only 22% of women indicated the same. While there is not much comprehensive data on AI use in Czechia, when related to health, both women and men express a similar willingness to use and trust AI tools - 31% for women and 33% for men.[36]

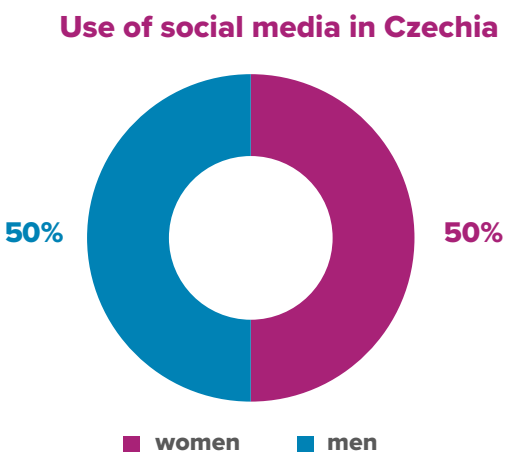
The Case Study: Czechia

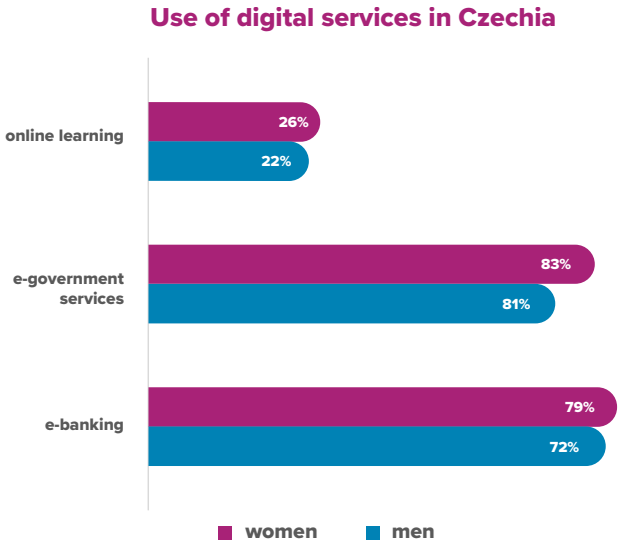
A preliminary analysis of prominent and visible Czech women on Instagram found that gender-based cyberviolence and sexist hate speech are prevalent. The field research covered a seven-day monitoring of reactions to Instagram posts of five influential Czech women, namely Danuše Nerudová (politician), Markéta Gregorová (politician), Johanna Nejedlová (politician), Trang Do (tech PR/influencer), and Olga Richterová (politician). In total, 30 posts and 556 comments were analysed, of which 209 reactions (37%) were positive and 246 comments (44%) were negative. The remaining comments were neither positive nor negative. Of the negative comments, 9% of the posts were overtly sexist, and 15% related to competence/ intelligence. Finally, 28% of reactions were related to ideological opposition. The remainder of negative reactions were characterised as “other”.

For 3 of the 5 women, negative comments were more prevalent than positive, reaching a ratio of two to one in two of the cases. However, the reactions depended strongly on the content of the posts. Posts about clothing, events, and commemorations for Alexei Navalny or murdered Slovak journalist Ján Kuciak were generally met with positive reactions. On the contrary, political posts were more negatively received. While the majority of the negative comments related to ideological differences or general dislike in all political posts examined, sexist comments and remarks on the womens’ intelligence were also discerned - some masked, some overt, and many often containing a combination of sexist remarks and comments oriented around questioning the intelligence of the women.

Furthermore, the analysis found that posts about feminist issues evoked the most negative and sexist reactions. In particular, a post from politician Markéta Gregorová on the non-ratification of the Istanbul Convention – combatting violence against women - sparked numerous hate comments and threats of a sexual nature. Similarly, in line with earlier findings, the analysis found that women from minority groups were also subjected to racist comments - often of a sexist and sexual nature, and mostly in reaction to political posts. These range from seemingly innocuous remarks like “Czechs love Vietnamese girls so your comment is redundant”[37] to overtly hateful and sexist remarks.[38] Sexist comments, concealed or overt, can discourage women from speaking out about political topics on social media or push them to disengage from it all together, which happened in the case of Linda Bartošová. The model and journalist who often speaks out about the position of women in society left Twitter/X, pointing to the frequent criticism and insults in the replies section.

33 https://datareportal.com/reports/digital-2024-czechia
34 https://oosga.com/social-media/cze/#:~:text=Social%20Media's%20User%20Demographics%20in,of%20users%20has%20grown%208.9%20%25.
35 https://digital-strategy.ec.europa.eu/en/policies/desi
36 https://www.researchgate.net/publication/378610320_Artificial_intelligence_and_health_How_do_Czech_adults_use_AI
37 Reaction to Trang Do, Vietnamese Czech writer and working in tech PR
38 In the case of Johanna Nejedlová, politician of colour for the Czech green party





Women as Architects of the Digital Space

"Lack of representation and participation of women in decision-making processes of the digital space can limit women's agency and influence in the field. There is still some work to be done on diversity and inclusion"

Katerina Magnna, co-founder of Czech Women in AI Network (CWAI) and Government Affairs Lead, Microsoft Czech Republic, Slovakia and Hungary, Czechia.

In Czechia, 27% of all STEM graduates are women, below the 33% EU average. Furthermore, women graduating in ICT disciplines represent an even lower percentage at 15%.[39] Only 10% of tech professionals are women, putting Czechia also towards the bottom on women's participation in tech fields specifically.[40] Far under the EU average on this metric, Czechia ranked 25 out of 28 (former) EU member states in 2019.[41] Women in ICT account for 1% of total employment, compared to 8% for men. This pattern underscores a problem not only for gender equality, but also for the Czech economy, as the country is currently experiencing a labour gap of 15 000 digital specialists.[42] In the meantime, the unadjusted pay gap stands at 30%.[43]

While Czechia is often hailed as a great environment for tech entrepreneurs,[44] women still encounter problems in entering the sector.[45] For example, there remains a large imbalance in the share of investments in startups. In Czechia, only about 3% of startup investments go to women.[46] In addition, women are underrepresented in AI research and development. Indeed, data show persistent gender imbalances in AI publications, with only 25% of publications co-authored by at least one woman in the Czech Republic, performing worse than its counterparts in the V4 and Austria.[47]

39 https://www.dzs.cz/en/article/czech-experts-discussed-gender-inequalities-education#:~:text=This%20problem%20does%20not%20only,Republic%20it%20is%20only%2027%25.
40 https://www.oecd-ilibrary.org/deliver/abfe755f-en.pdf?itemId=%2Fcontent%2Fpaper%2Fabfe755f-en&mimeType=pdf
41 https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf
42 https://vupi.cz/udalosti/s-hospodarskou-komorou-a-huawei-jsme-odstartovali-program-podpory-zastoupeni-zen-a-divek-v-technologiich/
43 https://digital-strategy.ec.europa.eu/en/policies/desi
44 https://www.ifp.cz/fr/homepage/event2480-%E2%80%9Cwomen-in-tech-%E2%80%93-the-gender-algorithm%E2%80%9D#/
45 https://www.czechitas.cz/english-blog/from-gender-digital-divide-to-womens-digital-potential
46 https://www.expats.cz/czech-news/article/interview-future-females-support-women-in-leadership-roles
47 https://www.ifp.cz/fr/homepage/event2480-%E2%80%9Cwomen-in-tech-%E2%80%93-the-gender-algorithm%E2%80%9D#/

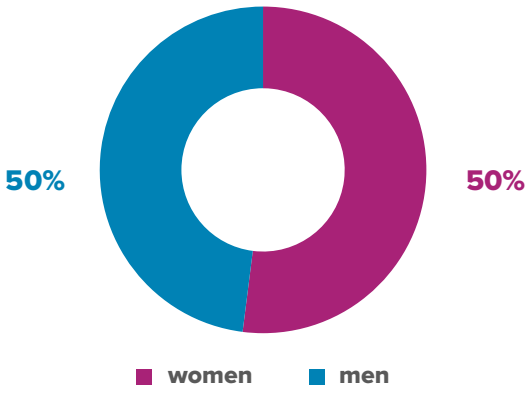
Poland

Women as users of the digital space

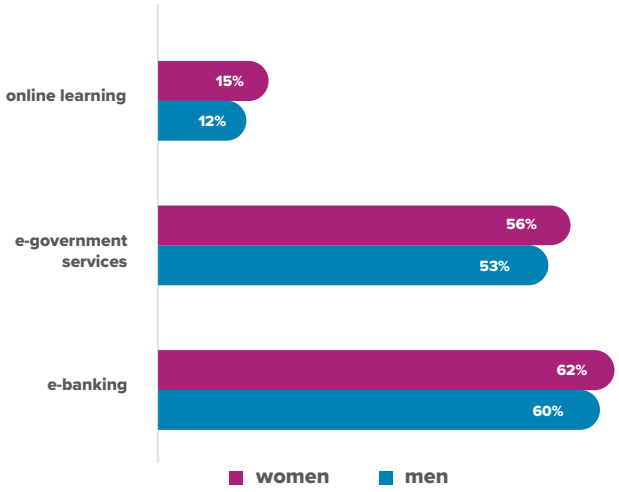
The vast majority of household in Poland have access to the Internet (93%), connectivity that has been facilitated by affordable rates.[48] Women tend to spend more time on social media per day (2 hours and 4 minutes; men 1 hour and 58 minutes). Female users also constitute a slight majority (52%) on social media, mirroring the country's demographic composition, but the advantage is more visible on Instagram (58%), TikTok (55%), and to a lesser extent Facebook (53%).[49, 50] What sets Poland apart is that, after Greece, it is the country where the highest number of users rely on social media as their go-to source of information.[51] However, this overreliance exposes users to online misinformation, and according to Digital Poland, female users are more prone to believing fake news.[52]

Women utilize digital tools for communication, learning, and professional growth, which allows for "effectively removing geographical and societal barriers."[53] Women in Poland are more active than men in using e-banking (62% to 60%), e-government services (56% to 53%), and e-learning (15% to 12%).[54] Despite their extensive online presence, digital literacy remains low, with 43% of women possessing at least basic digital skills compared to men at 46%,[55] one of the lowest rates in the EU.[56] Regarding AI, 37% of women use it privately or professionally, with higher-educated, urban, and young women tending to see more benefits from AI usage.[57]

Use of social media in Poland



Use of digital services in Poland



48 https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w-2023-roku,1,17.html
49 https://www.iab.org.pl/bez-kategorii/social-media-2023-pierwsza-edycja-raportu-gemius-pbi-i-iab-polska-juz-dostepna/
50 https://empemedia.pl/social-media-w-polsce-2023-raport-digital-poland/
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52 https://digitalpoland.prowly.com/178556-mlodzi-polacy-bezradni-wobec-dezinformacyjnego-chaosu
53 Interview with Estera Kot, Principal Product Manager at Microsoft, Poland
54 https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021
55 https://stat.gov.pl/en/topics/science-and-technology/information-society/information-society-in-poland-in-2023,1,10.html
56 https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021
57 https://ue.poznan.pl/aktualnosci/sztuczna-inteligencja-czego-obawiaja-sie-kobiety-pracujace-w-polsce/

The Case Study: Poland

Five monitored accounts included Barbara Nowacka (109K followers), Beata Szydło (14,5K followers), both politicians from contrasting political backgrounds), Anna Lewandowska (5,6M, a prominent sport entrepreneur), Joanna Koroniewska (769K, an actress), and Ilona Kostecka (123K, a parenting blogger). The last two persons were also selected due to their advocacy for gender equality and body positivity, which previously subjected them to online attacks. In total, 24 posts and 1526 comments were analysed. The analysis found that the overall percentage of negative comments visible on the monitored Instagram accounts was relatively low (17%) and varied not only depending on their respective activities and content, but also selected settings. Following a global trend, most negative comments were found on accounts of politicians. Szydło, a right-wing populist politician, who tends to use **polarizing language,** received a disproportionately high number of negative comments (64%), despite having the fewest followers among the monitored accounts. Comments, often very vulgar and derogatory, mostly targeted her appearance, rural background, or political affiliation and rarely referred directly to the content of her reels. Barbara Nowacka, a centre-left politician serving as Minister of Education, received fewer (16%) negative comments than Szydło, but still more than other observed accounts. Her content in the monitored period centred on her ministerial duties, causing less polarisation.

It may be necessary to observe her account for a longer period to ascertain whether the percentage of abusive comments would be higher for other types of content. Other monitored women received minimal negative feedback, not exceeding 3% of received comments. This could be attributed to less socially polarising content. However, even Ilona Kostecka, who openly addressed entrenched biases and gender inequality in her reels in the monitoring period, received few negative comments. Upon request, she confirmed that she **restricted comments** to followers only and thus reduced abusive attacks. Instagram was therefore more pleasant compared to platforms like Facebook or TikTok. This means that the activation of Instagram's settings against abusive comments may indeed shield users from unfair attacks. This might also have been an additional explanation for the fewer negative comments posted on Barabara Nowacka's account. On the other hand, without such restrictions, hate speech may **remain rampant** as Beata Szydło's case demonstrates.

Women as Architects of the Digital Space

Poland's relatively high number of female STEM graduates (42%) does not translate into a corresponding proportion of ICT specialists.[58] Women comprise only 17% of all ICT employees in Poland, slightly below the EU average,[59] with female digital specialists 1% of total employment and male digital specialists at 6%. However, the entire industry is suffering from talent shortages, estimated at 150,000 specialists.[60] Among all women in the digital sector, 22% studied IT and nearly 43% transitioned from other fields after reskilling, with only 3% specializing in AI.[61] The unadjusted digital gender pay gap is reported at 27%.

The startup sector in Poland remain a male stronghold - 11% of startups have no female employees and women constitute more than 51% of all employees in only 22% of startups.[62] Despite numerous challenges, women make up 26% of deep tech startup founders or C-suite members.[63] In Polish venture capital (VC) and private equity (PE), which are crucial for startup investment, only 8-9% of management roles are held by women. Whereas non-investment roles are women-dominated (74%), investment roles lack gender balance. Women-led VC was more likely to invest in female-founded startups.[64]

58 https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20230602-1
59 https://ec.europa.eu/eurostat/statistics-explained/images/0/05/Distribution_of_persons_employed_as_ICT_specialists_2012_and_2022_%28%25%29.png
60 https://pie.net.pl/wp-content/uploads/2022/11/PIE_Raport_Ilu-specjalistow-IT-brakuje-w-Polsce.pdf
61 https://www.kobietyebiznesu.pl/wp-content/uploads/2023/03/Kobiety-w-IT-2023-raport-technologia-Insights.pdf
62 Ibid. https://digital-strategy.ec.europa.eu/en/policies/desi
63 https://aperventures.com/polish-deeptech-startups-women/
64 https://psik.org.pl/images/Dane-i-raporty/Raporty/Women-In-PEVC-Report_November-2021.pdf

Slovakia

Women as Users of the Digital Space

Slovaks broadly use the Internet, with up to 85% in the country engaging regularly with at least one social network (Facebook, Messenger, and Instagram are the top platforms).[65] A disparity in social media usage between women and men is evident, with 53% of women and 47% of men actively engaging on these platforms several times a day and being a more prominent users (52% on Facebook, 53% on Instagram and 74% on Pinterest). Exception to this pattern is observed on LinkedIn (46%) and Twitter/X (27%), where men exceed women of usage and frequency.[66,67]

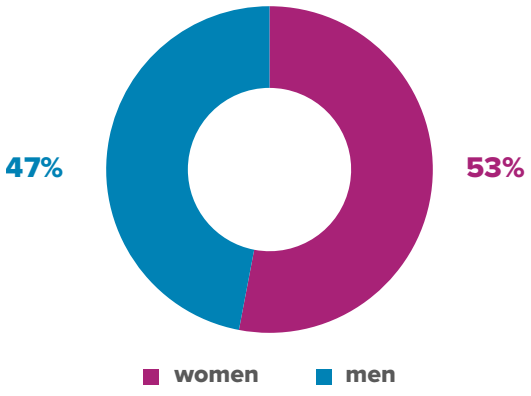
Gender disparities are further apparent in terms of digital literacy. As far as working with electronic information is concerned, women predominantly are proficient in basic techniques, with 52% reporting basic digital skills (men report 58%), while men more frequently delve into advanced aspects, including encryption and programming (24% of men possess an above basic level of skills compared to only 18% of women).[68, 69]

Women in Slovakia demonstrate robust online engagement, with 87% using the internet for various activities such as online banking (64%). This is just shy of the 66% of their male counterparts. In the realm of e-learning, Slovak women display an inclination towards digital education, with 19% engagement compared to 17% for men. The use of e-government services is equally notable, with women and men's use at 62%.[70]

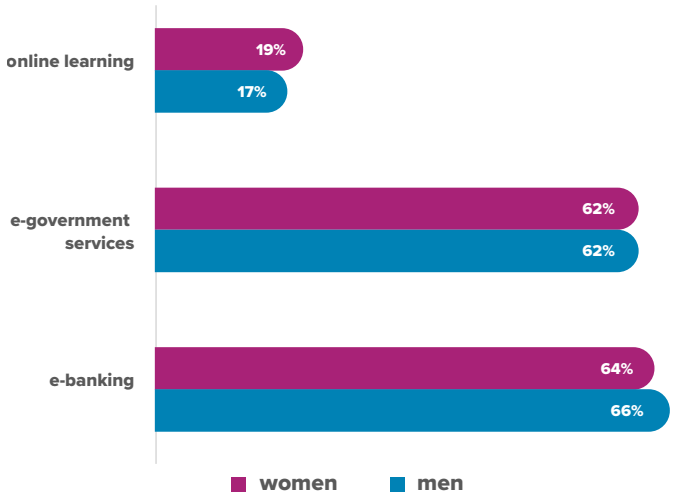
However, women exhibit a lower level of awareness concerning cybersecurity in Slovakia. Research findings indicate that 73% of women do not actively seek information on this subject, a figure higher than that of men (53%). Additionally, in self-assessments about cybersecurity, 41% of women acknowledged having "low knowledge and skills," in contrast to men who more frequently indicated "average knowledge and skills" (52%).[71]

At present, there seems to be no verifiable comprehensive information on how Slovak women use AI in their daily lives. However, a survey revealed that women are more skeptical towards AI, with only a third of women seeing benefits compared to over half of men. Regarding the application of AI in practice, 65% of women support its use in office tasks, whereas this opinion is more widespread among men (77%).[72]

Use of social media in Slovakia



Use of digital services in Slovakia



65 https://www.go4insight.com/post/koľko-slovákov-je-na-sociálnych-sieťach-v-roku-2022
66 https://cybercompetence.sk/wp-content/uploads/dokumenty/kniznica/zborniky_a_prezentacie/AVKB_zbornik_2022.pdf#page=35
67 https://datareportal.com/reports/digital-2023-slovakia
68 https://cybercompetence.sk/wp-content/uploads/dokumenty/na_stiahnutie/letak_KB-prieskum_verejnej_mienky_msp_2023.pdf
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72 https://sita.sk/vtechnologiach/treba-sa-bat-umelej-inteligencie-muzi-a-mladi-v-nej-vidia-prinos-zeny-sa-obavaju-rizik/

The Case Study: Slovakia

Instagram is the third most popular social network, with approximately 42% of the population using it and its usage gradually expanding beyond young demographics to include middle aged individuals (up to 40 years old) and parents of young teenagers.[73] The observed individuals in the study included three currently serving politicians: Zuzana Čaputová (President of the Slovak Republic), Vladimíra Marcinková (member of the Slovak parliament and advocate for human rights, minority rights, and women's rights), and Jana Bittó Cigániková (member of the Slovak Parliament, campaigner for women's rights). Additionally, two other visible women profiles screened included Veronika Cifrová Ostrihoňová (former TV editor and presenter)[74], currently running for the European Parliament, and Kristína Tormová (an actress and writer).

In the monitored period, a total of 32 posts with 4,250 comments were tracked across all accounts. The comments were 93% positive and 7% negative, signifying overall positive sentiment. Notably, **women politicians emerged as the primary target for negative comments,** exhibiting a direct correlation with their public activities. The analysis also affirmed the widely acknowledged phenomenon that posts expressing outrage over events, phenomena, or situations tend to attract more reactions and shares compared to conventional posts.[75] Individual scrutiny of monitored politicians unveiled nuanced insights, with both Čaputová and Marcinková recipients of lower percentages of negative comments (7% and 10%, respectively). Conversely, Jana Bitto Ciganiková garnered the highest percentage of negative comments (39%), with specific days witnessing the prevalence of negative comments over positive ones. Ostrihoňová and Tormová, on the other hand, received notably low percentages of negative comments (2% and 3%, respectively).

Instances of **sexist comments** were identified in discourses surrounding President Čaputová and Jana Bitto Ciganiková. Noteworthy examples included comments on their physical appearance. Additionally, President Čaputová faced comments related to her personal life. Nevertheless, it is essential to underscore that the predominant share of negative comments across all scrutinised women primarily revolved around **ideological disparities,** work-related contexts, or general dissent.

Women as Architects of the Digital Space

The underrepresentation of women at all levels of the digital sector is a shared challenge both in Slovakia and across Europe.[76] Slovakia currently ranks 23rd out of 27 EU Member States in the 2022 Digital Economy and Society Index (DESI), indicating significant room for improvement. Despite hovering around the EU average in terms of human capital indicators, only 16% of ICT specialists in Slovakia are women, falling short of the EU average of 19%.[77] Women employed in the digital field constitute 1% of total national employment compared to men at 7%.[78]

It is notable that female STEM graduates in Slovakia (34%) are above the EU average at 32%.[79] Clearly, a missing link exists between educating female talent and leveraging their skills in the labour market. The 27% gender pay gap[80] might be one of the contributing factors for such misalignment. Simultaneously, Slovak women show less interest in working in the IT sector compared to men. While only 6% of women express definite interest in IT work, this figure for men stands at 18%.[81]

73 https://www.go4insight.com/post/koľko-slovákov-je-na-sociálnych-sieťach-v-roku-2022
74 Shortly after the fieldwork concluded, Cifrova Ostrihoňová announced she was running in the European Parliament elections.
75 https://cybercompetence.sk/wp-content/uploads/dokumenty/kniznica/zborniky_a_prezentacie/AVKB_zbornik_2022.pdf#page=35
76 https://digitalnakoalicia.sk/article/dievcata-v-ikt/
77 https://ec.europa.eu/newsroom/dae/redirection/document/88712
78 https://digital-strategy.ec.europa.eu/en/policies/desi
79 https://op.europa.eu/webpub/eac/education-and-training-monitor-2022/en/country-reports/slovakia.html
80 https://digital-strategy.ec.europa.eu/en/policies/desi
81 https://cdn.ajtyvit.sk/2023/11/web-PrieskumZenyvIT2023-A4.pdf

Challenges, barriers, negative trends

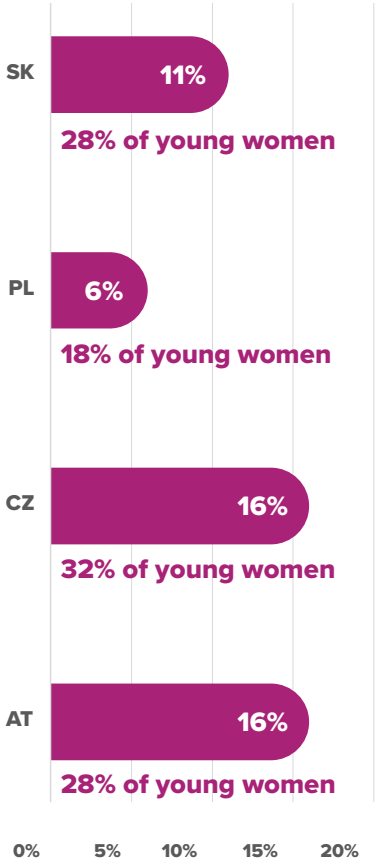
"The underrepresentation of women in tech also extends to AI ethics and development. This lack of diversity can lead to biases in AI algorithms and systems, perpetuating gender stereotypes and inequalities."

Lenka Hlinkova, Founder of Ženský algoritmus/Female Algorithm, Slovakia

1. Gender-based cyberviolence

Gender-based abuse and violence proliferates online due to the ease of contact, tracking, invasion of privacy, and dissemination of harmful data enabled by digital technologies. Cyberviolence ranges from sexist hate speech, doxing, and unsolicited receipt of sexual content to cyberstalking, malicious use of nudifying apps, and identity theft. CE data reveals the pervasive scale of such attacks, especially targeting women. In Austria, 16% of women have reported instances of cyberviolence, with 28% of young women aged 16-29 experiencing cyber harassment in the past five years.[82] Even more worrisome is the data showing that 63% of girls aged 15-18 have reported at least one instance over the past year.[83] In Czechia, 16% of women have been the victim of online harassment over the past five years, with 32% of this group aged 16-29.[84] Similarly, in Slovakia, 11% of women have reported cyberviolence and among women aged 16-29, 28% experienced cyber harassment in the past five years.[85] In Poland, only 6% of women have reported online harassment in the past five years but 18% of young women aged 16-29 have suffered cyberviolence.[86]

Reporting cyberviolence in last five years



The available data may only be the tip of the iceberg as numerous cases are assumed to be underreported. Published results are further often not gender-disaggregated, and available research on the gendered aspects of cyberviolence is insufficient in relevance to its scale. Cyberviolence is often treated by authorities as a less serious phenomenon than physical or sexual violence offline.

Women in fields traditionally perceived as male strongholds (e.g. politics) or who are advocates for feminist causes (activists, journalists) are particularly susceptible to cyberbullying aimed at silencing them or prompting self-censorship. This report's case studies find further support of this negative trend.[87]

Cyberviolence can have serious impacts on victims, resulting in immediate outrage, long-term psychological trauma, and withdrawal from social media and even social interactions. Data from Austria starkly illustrates this point, with 1 in 5 women compelled to temporarily or permanently withdraw from social media use after cyberviolence, while 13% deleted their accounts and 8% changed their contact details.[88]

Meanwhile, law enforcement varies, with Austria setting a positive example and implementing its Law to Combat Online Hate policy since 2021.[89] In Czechia, Poland, and

82 https://eige.europa.eu/gender-equality-index/2021/domain/violence/AT
83 https://www.weisser-ring.at/wp-content/uploads/2018/10/Broschuere-Gewalt-im-Netz.pdf
84 https://eige.europa.eu/gender-equality-index/2021/domain/violence/CZ
85 https://eige.europa.eu/gender-equality-index/2021/domain/violence/SK
86 https://eige.europa.eu/gender-equality-index/2021/domain/violence/PL
87 For journalists, this is further evidenced by the findings of the CEE Her Report Women's Voices in the Media: A Look at Central Europe (2022)
88 https://www.weisser-ring.at/wp-content/uploads/2018/10/Broschuere-Gewalt-im-Netz.pdf
89 https://www.parlament.gv.at/gegenstand/XXVII/I/481

Slovakia, cyberviolence per se is not explicitly regulated by national law, but other legal provisions are used to prosecute this type of crime.

2. Algorithms can reinforce harmful perceptions and gender biases

Gender stereotypes can be perpetuated and reinforced in the digital space, as algorithms trap users in information bubbles in accordance with their interests and existing beliefs. Such designs that limit available content can impact women's self-perception. For example, 17% of female users in Poland actively seek acceptance online.[90] Furthermore, 70% of surveyed women in a Polish campaign admitted that social media affects their self-perception, whereas 26% claimed that after looking at photos on social media, they felt bad about their appearance.[91]

Advertising of well-established companies can also contribute to this negative trend. For instance, a recent campaign by Česká spořitelna, one of the largest banks in Czechia, portrayed a woman with the caption "Do I look like I understand investing?". The image, which went viral on social media, reinforced gender stereotypes in investment banking.[92]

The gender gap extends its reach into emerging technologies, as highlighted by research conducted by the The Empelen Institute of Intelligent Technologies (KInIT) on AI systems working with the Slovak language. This investigation reveals pervasive gender bias, bringing forth ethical challenges in technology development. The study found that all examined AI systems exhibit unfair behaviour, with speech-to-text models displaying higher error rates with female voices and machine translation tools often utilizing generic masculine forms, thereby reflecting deep-seated gender biases.[93]

3. Impact of insufficient digital literacy on employment opportunities

Across the analysed countries, basic digital literacy among women varied. The highest levels were measured in Austria (61%) and Czechia (60%). Slovakia (52%), meanwhile, stood exactly at the EU average and Poland (41%) lagged behind.[94] Only Czechia has achieved equity in the basic digital competence of men and women. It is notable that 90% of jobs in the EU now require at least basic digital skills.[95] Insufficient digital literacy, therefore, may lead to the digital exclusion of women in the workplace. Hybrid work, seen as one potential avenue for providing women with flexibility, often requires above basic digital competence and for these skills to be consistently updated. In countries like Czechia, where generous maternity leave spans an average six years, further challenges are posed for mothers when they (re)enter the workforce without upskilling.[96]

Moreover, some concerns persist related to the effects of AI and digitalisation on women's employment (employability, job security, career advancement, work-life balance), though the data varies. In Slovakia, only a third of women report seeing the benefits of AI, while over half of men perceive advantages in this field.[97] In Poland, recent research has indicated that half of surveyed women believe that AI will increase unemployment levels, with one in five saying it may lead to a decrease in wages and worsen their professional status and three-quarters that it will be detrimental to work-life balance.[98] On the other hand, other sources suggest that 65% of female respondents do not see technology as a threat to their jobs.[99] Practitioners in the field believe that the concerns are a natural reaction (as with all changes) but "the main thing now is to learn how to use (the technology) and not to be afraid to use it. Every innovation is initially associated with some anxiety."[100]

4. Gender stereotypes leading to underrepresentation of female ICT students and academics

The percentage of women employed as ICT specialists in the analysed countries leaves much to be desired (Austria 19%, Poland 17%, Slovakia 15%, Czechia 11%).[101] The challenge of entering the digital field lies in the requirement for specialised higher education which cannot always be easily addressed through reskilling. Despite high demand for IT and AI experts, companies are struggling to recruit enough (female) professionals. In German speaking countries, including Austria, 59% of women perceive the ICT field in general

90 https://lbrmedia.prowly.com/137710-samoocena-kobiet-a-media-spolecznosciowe-czy-polki-sa-podatne-na-opinie-zewnetrzne-najnowsze-wnioski-z-badania-kampanii-wkobiece-jglowie
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93 https://kinit.sk/sk/rodove-predsudky-v-slovenskej-umelej-inteligencii-podla-ai-su-zeny-emocionalne-a-muzi-racionalni/
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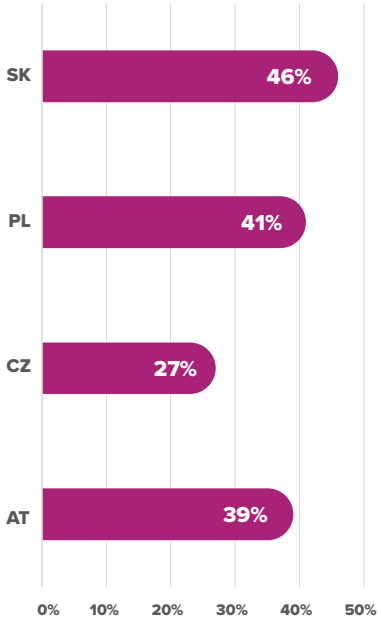
95 https://data.europa.eu/en/publications/datastories/digital-literacy-eu-overview
96 https://www.czechitas.cz/english-blog/from-gender-digital-divide-to-womens-digital-potential
97 https://sita.sk/vtechnologiach/treba-sa-bat-umelej-inteligencie-muzi-a-mladi-v-nej-vidia-prinos-zeny-sa-obavaju-rizik/
98 https://ue.poznan.pl/aktualnosci/sztuczna-inteligencja-czego-obawiaja-sie-kobiety-pracujace-w-polsce/
99 https://swresearch.pl/raporty/tytanki-pracy-kobiety-na-rynku-pracy-2021#report-download
100 Interview with Petra Kotuliaková, Founder of Aj ty v IT, Slovakia
101 https://ec.europa.eu/eurostat/statistics-explained/images/0/05/Distribution_of_persons_employed_as_ICT_specialists_2012_and_2022_%28%25%29.png

Academic publications with at least one woman as co-author



to be intimidating.[102] In Poland, as many as 91% of women believe that IT is a male sector. Parental influence substantially shapes the study choices of girls, with 59% following their recommendations and only 6% of young women feeling their families would approve of them studying IT.[103]

A low number of female ICT students and in turn academics contributes to less involvement of women in publishing papers, maintaining public visibility, and ensuring non-biased research. The available data also underscores persistent gender imbalances. Namely, in Czechia, only 27% of publications are co-authored by at least one woman. Slovakia is closest to parity at 46%. For their part, Austria and Poland recorded percentages of 39% and 41%, respectively.[104]

5. Missing role models and leaders

The limited representation of female professionals in the digital field that girls could engage with in their immediate environments, as well as in media and popular culture, combined in some cases with low digital literacy, decreases the likelihood of young people developing an interest in becoming architects of the digital space.

Women rarely hold senior positions. There is currently a "lack of representation and participation of women in decision-making processes of the digital space, which can limit women's agency and influence in the field."[105] The fewer women in leadership positions, the less likely women will perceive the field as professionally sustainable, which "can leave women feeling isolated and without a clear path to leadership positions."[106] Furthermore, the lack of role models is a barrier which "(negatively) contributes to the ongoing struggle for gender equality in tech."[107]

6. Challenging work-life balance in cutting-edge fields

Balancing career and personal life, particularly after starting a family, is challenging in new fields like AI. The fast pace and the necessity for ongoing education and upskilling is highlighted by professionals. "The tech industry's demanding pace and sometimes inflexible work schedules can be daunting, potentially discouraging women from entering or remaining in the field."[108] Furthermore, practitioners note that women in the digital field, as in other industries, experience challenges in combining motherhood with their careers. Even established women in AI see the steep curve for them vis-à-vis their male counterparts.[109] Moreover, interviewed women architects in the digital field point to stereotypes, judgement, and role expectations, especially related to motherhood. Indeed, Eurostat data confirms that the drop-out rate among women working in the digital sector by far exceeds that of men.[110]

"People comment, judge, and hate and it is not an environment for everyone, you have to have some stamina"

Vanda Seidelová, co-Founder of Educleus & Twigsee, Czechia

7. Concentration of AI industry in the Silicon Valley

Geography poses a less discussed, yet an equally significant challenge. "The concentration of tech innovation on the US West Coast creates a perception that opportunities are geographically limited, despite the rise of remote work and hybrid workplaces. This can deter talent from other regions from entering the field or limit their access to certain opportunities and networks."[111] While the high demand for IT experts presents new opportunities, investors in CE may be cautious towards supporting these ideas, considering them too risky.[112] This in turn may contribute to a sense of squandered potential among professionals or brain drain.

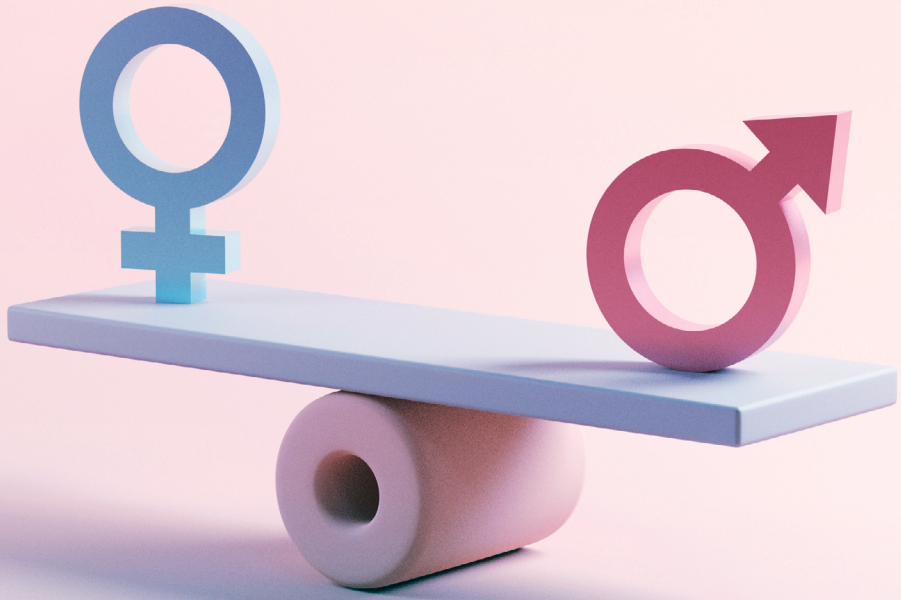
102 https://itwelt.at/printausgabe/mehr-frauen-in-die-it/
103 https://www.rp.pl/biznes/art38702481-firmy-it-nie-dla-pan-dlaczego-w-polsce-brakuje-programistek
104 https://oecd.ai/en/data?selectedArea=ai-research&selectedVisualization=share-of-women-in-scientific-publications-by-country-2
105 Katerina Magnna, Co-founder of Czech Women in AI Network (CWAI) and Government Affairs Lead at Microsoft Czech Republic, Slovakia and Hungary
106 Interview with Lenka Hlinková, Founder of Ženský algoritmus/Female Algorithm, Slovakia
107 Interview with Alicja Kwaśniewska, Senior Principal ML Architect at SiMa.ai, Poland/USA
108 Interview with Lenka Hlinková, Founder of Ženský algoritmus/Female Algorithm, Slovakia
109 Interview with Żaneta Świderska-Chadaj, Professor, University of Warsaw, Poland
110 https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739380/EPRS_ATA(2023)739380_EN.pdf
111 Interview with Estera Kot, Principal Product Manager at Microsoft, Poland
112 https://www.forbes.pl/forbeswomen/podcast-forbes-women-sztuczna-inteligencja-nowe-zawody-szansa-dla-kobiet/fd7e6cq

8. Glaring gender pay gap in the digital sector

Although the tech industry appears to be very inclusive and open to women, the disparity in ICT salaries is glaring (at a 19% average across the EU)[113] and exceeds the overall unadjusted gender pay gap in the EU (13%).[114] The CE countries all exceed the EU average in digital fields (20% for Austria, 30% in Czechia, and 27% for Poland and Slovakia).[115]

The underlying reasons require further research, though a combination of bias, the types of positions held by women (e.g., non-digital specialist jobs), and a lack of pay transparency (except for Austria) might be contributing.

Some networks make an effort to counter this negative trend. "Addressing the wage gap and advocating for equal pay has also been a crucial part of our work," underscored Lenka Hlinkova.[116] Moreover, data from Czechia suggests that, due to a considerable lack of ICT specialists in the labour market, new female employees are being hired under the same (wage) conditions as their male counterparts.[117]



113 https://digital-strategy.ec.europa.eu/en/policies/desi
114 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics#:~:text=For%20the%20economy%20as%20a,in%20Estonia%20(Figure%201).
115 https://digital-strategy.ec.europa.eu/en/policies/desi
116 Interview with Lenka Hlinková, Founder of Ženský algoritmus/Female Algorithm, Slovakia
117 https://digilib.uhk.cz/bitstream/handle/20.500.12603/537/NEDOMOVA_Lea_Milos_MARYSKA_Petr_DOUCEK.pdf?sequence=1&isAllowed=y#:~:text=Despite%20this%20decrease%2C%20the%20gender,was%2022.12%25%20among%20ICT%20Professionals.

Opportunities, positive developments, best practices

1. Combining flexible work with family life

Ongoing digitalization and AI, accelerated by the pandemic, has changed the way the workplace functions and the approach to daily life. "It takes away the burden of less important and analytical work and creates space for the more creative part of the job."[118]

Moreover, as digitalisation enables remote work, it can support women's employment by providing options to continue working longer into a pregnancy or facilitate an expedited return to the labour market after childbirth, for example. "AI is there to help us, to speed up some of the processes. (...) The digital space provides a lot of space for women, also with regard to potential maternal responsibilities, because it is beautiful in its flexibility."[119] Greater work flexibility is closely linked with higher employment rates among mothers.[120] This would explain why working from home is more prevalent among self-employed women than among men across Europe.[121] In Czechia, twice as many self-employed women work from home as men.[122] For 74% of Polish female digital specialists, the possibility of home office is a decisive factor in their career choices, ahead of professional development and high salaries. This would explain why 51% of women who transferred to the industry from other sectors are mothers. However, this may depend on their respective roles in the digital industry and could prove to be potentially less applicable in high-paced fields like AI.[123] Furthermore, it should be stressed that remote work can blur the boundaries between home and employment, threatening a healthy work-life balance. Employees working via home office also enjoy fewer promotion opportunities.[124]

2. Platforms committed to protective settings as a safe heaven

In all analysed countries, women make up the majority of Instagram users. With some exceptions (mostly politicians), abusive comments were not as rampant as expected.

Instagram has implemented numerous effective policies to curb hate speech and abusive comments, including gendered hate speech, on its platform. Users can restrict, delete, or block individual comments and define offensive words and phrases which will be automatically blocked. Additionally, the settings permit users to limit comments to followers only or block comments from certain accounts, and comments can be disabled entirely. Instagram also takes action against harmful behaviour by disabling accounts and preventing new accounts from the same IP address. Instagram notes that a large share of abuse takes place via direct messages (DM), which are harder to address than comments.[125] Moreover, the platform applies AI to stem abusive comments and messages. Users are warned when they are about to post something that might be hurtful.[126]

Although there is still room for improvement, these measures demonstrate how recent technological developments can be effectively applied to protect users, especially women, who are more often targeted. This also underscores the feasibility of creating a protective environment on social media, which, among many factors, may also depend on the will of its owners.

118 Interview with Petra Kotuliaková, Founder of Aj ty v IT, Slovakia
119 Interview with Blažena Sedrovičová, CEO at AI Dental, Slovakia
120 https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf
121 https://www.oecd-ilibrary.org/docserver/abfe755f-en.pdf?expires=1708354931&id=id&accname=guest&checksum=EE964F99C7569EB8B1914302EB3605CB
122 https://www.oecd-ilibrary.org/deliver/abfe755f-en.pdf?itemId=%2Fcontent%2Fpaper%2Fabfe755f-en&mimeType=pdf
123 https://www.kobietyebiznesu.pl/wp-content/uploads/2023/03/Kobiety-w-IT-2023-raport-technologia-Insights.pdf
124 https://www.wsj.com/lifestyle/careers/remote-workers-are-losing-out-on-promotions-8219ec63?st=11xgbfevrw3v6e3&reflink=article_copyURL_share
125 https://about.instagram.com/blog/announcements/an-update-on-our-work-to-tackle-abuse-on-instagram
126 https://about.instagram.com/blog/announcements/national-bullying-prevention-month

3. Bottom-up initiatives driving digital education

Efforts to spark girls' and women's interest in the digital field have gained traction, particularly through dynamic NGOs which encourage girls to code and challenge gender stereotypes from an early age through educational books, workshops, and programming courses. In Austria, Let's Empower Austria (LEA) can serve as an example.[127] It organises Role Model get-togethers, youth summits, school visits, and workshops for all ages. In Poland, there are initiatives such as the IT Girls Foundation targeting predominantly girls, or Foundation "Perspektywy", which has promoted women in STEM and IT for 11 years through campaigns such as Girls as Engineers ("Dziewczyny na Politechniki") and scholarships. In the Czechia, organisations like Czech Women in AI (CWAI) focus on promoting AI awareness, best practices, and networking among women in the field, while Czechitas leads IT skills training initiatives aimed at closing the gender digital divide, enhancing STEM education, and providing affordable digital skills training for all.[128] Slovakia's Aj ty v IT and Ženský algoritmus are essential in building a solid base of girls and women who are prepared to enter the digital field. From early age motivation and skills-building to re-skilling for mothers and interested women both organizations are helping Slovakia's digital industry to begin mitigating already noted challenges.

4. Showcasing women in the digital space and creating support networks

Despite challenges in the digital field, numerous peer-to-peer networks and mentoring initiatives have emerged. Aimed at facilitating professional growth, these may be less formal and coordinated by experts themselves or within the companies they work for. International networks such as Women in AI (WAI)[129] have national chapters in most countries, including Austria and Poland, and play an important role in fostering connections and impactful projects. The demand for such initiatives is high as "women in IT fight with the lack of educational opportunities, lack of mentors, lack of IT coaches."[130] Platforms like CWAI and Czechitas in the Czechia serve as educational, mentoring, and support communities. Events and initiatives such as the Women in Data Science Villach conference in Austria or Women in Tech organised by ITforSHE in Poland offer mentoring and exchange of information in a conducive environment.

These efforts challenge stereotypes and promote women's contributions in shaping the tech landscape. There has been a visible rise in inspiring narratives and thought leadership initiatives led by women entrepreneurs, amplifying their presence in the industry.[131]

5. Digital industry needs female talent

Bolstered by the current high demand for digital specialists, women enjoy an opening to enter the industry in higher numbers, which could pave the way for more career paths and leadership roles for women.[132] For example, through the rapidly expanding field of Generative AI, new women are becoming attracted to work, with no gender divide observed.[133] Businesses might be more open to attracting talent from other sectors and reskilling people offering competitive salaries, as well as benefits tailored to women's needs.

Closing the STEM talent gap, however, remains a continued priority. If successful, doing so could increase the EU's GDP per capita by up to 3% by 2050. This effect would be particularly significant in Czechia, Poland, and Slovakia.[134]

6. Women in AI as contributors to societal good and improving women's health

Having more women in AI, who collaborate with female doctors, could help prevent men-dominated health data or biased tools for diagnosis. Female AI experts are aware of that and are taking active measures. "The digital domain (...) empowers women entrepreneurs to innovate, particularly in areas where AI can be revolutionary, such as healthcare and education."[135]. Startups with women in leading roles are innovating AI-driven solutions for infertility, aiming to improve diagnosis and treatment. These contributions are alleviating the workloads of medical

127 https://letsempoweraustria.at/
128 Czech Women in AI – Professional Network and Czechitas, IT is the future!
129 https://www.womeninai.co/
130 Interview with Senta Čermáková, CEO of Czechitas, Czechia
131 Interview with Alicja Kwaśniewska, Senior Principal ML Architect at SiMa.ai, Poland/USA
132 Katerina Magnna, Co-founder of Czech Women in AI (CWAI) and Government Affairs Lead at Microsoft Czech Republic, Slovakia and Hungary
133 Interview with Senta Čermáková, CEO of Czechitas, Czechia
134 https://eige.europa.eu/newsroom/economic-benefits-gender-equality?.
135 Estera Kot, Principal Product Manager at Microsoft, Poland

practitioners.[136, 137] Moreover, considering cancer mortality rates in CE,[138] which in most cases exceed the EU average, AI could be a solution.[139] Research indicates that AI-assisted screenings, alongside radiologist evaluations, could improve outcomes.[140] With many countries facing pronounced medical staff shortages, integrating AI could enhance screening efficiency and save lives.

Furthermore, women more often prioritize ethical and inclusive AI development. “With AI becoming more integral to society, women lead the charge in advocating for ethical AI use, emphasizing policies that promote responsibility and equity.”[141] Simultaneously, women architects in the AI field often develop tools that contribute to socially good causes.[142]

136 https://www.mimfertility.ai/

137 https://www.medonet.pl/digital-health-innovators--iyoni--cel--wsparcie-kobiet-w-dbaniu-o-plodnosc-i-leczeniu-nie-plodnosci,artykul,56573212.html

138 https://cancer-inequalities.jrc.ec.europa.eu/country-cancer-profiles

139 https://www.oecd-ilibrary.org/deliver/04cfc3ee-en.pdf?itemId=%2Fcontent%2Fpublication%2F04cfc3ee-en&mimeType=pdf

140 https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(23)00298-X/abstract

141 Estera Kot, Principal Product Manager at Microsoft, Poland

142 Interview with Alicja Kwaśniewska, Senior Principal ML Architect at SiMa.ai, Poland/USA

Recommendations

Do not be afraid to step into IT and specifically into digital space, be open for change and learning new ways of working and new tools. We are as good as our male colleagues, do not underestimate yourself.

Marta Kaizerova, Head of Data Delivery Control Department, Erste Digital, Slovakia

To mitigate current challenges and meaningfully counter existing barriers, various stakeholders must collaborate closely together in a cooperative ecosystem. Workable solutions lie at the intersection of responsibilities for the EU, national governments, tech industry, civil society, and academia.

1. Protect women as digital users

To create a safer digital space for women, a multifaceted approach is required.

- Stronger **legal measures** at the national level are needed to address cyberviolence, including updating existing laws (Austria) and incorporating gender-based cyber violence into national legislation (Czech Republic, Poland).
- Proper **monitoring and swift penalisation** by the appropriate authorities when European legislations like the AI Act, the Digital Services Act, the Cyber Resilience Act, the Code of Conduct on Hate Speech, and the Code of Practice on Disinformation as well as national laws are violated.
- Meaningful and visible **societal campaigns** should raise awareness about potential risks for digital users in public spaces, fostering open discussions and educating girls and women on how to protect themselves while also condemning abusive behaviours.
- Simultaneously, encouragement for building a better society in the digital space is also necessary. Opportunities abound for transforming women's daily lives and careers. Therefore, positive campaigns are also desirable, through public-private cooperation.
- **Invest in digital literacy,** as this will allow users to understand the nature of cyberthreats, apply protective means as well as know where to seek support in the face of such crimes.

2. Foster formal and informal digital education at every stage of life

To close the digital gender gap in CE, comprehensive digital education and training for women of all ages is vital. This includes investments in girls' education, particularly for those from marginalised backgrounds. Changing social attitudes is a long-term task, but it can start with sensitising IT teachers to avoid gender stereotypes and provide inclusive examples during classes. Establishing extracurricular activities and mentoring initiatives for girls can also create a supportive environment. Public private partnerships should be emphasised in reaching young girls (and boys).

Additionally, lifelong learning programmes should be accessible to users of all age groups. Systematic and strategic support from national governments, and a much better portfolio of financial products, which would support life-long learning programmes, are broadly advocated by organizations implementing such training.[143] Continuous improvement of digital literacy is essential but may also require a change of approach by the women themselves—to take the initiative in their own hands.

"Women should stay informed and educated on emerging technologies and digital trends to empower them to make informed decisions and stay competitive in the digital landscape."

Alicja Kwaśniewska, Senior Principal ML Architect at SiMa.ai, Poland/USA

3. Increase the visibility of role models

Increasing the visibility of women in the digital field inspires more girls and women to pursue careers in the industry. Women already with successful careers should assume the responsibility of serving as role models and mentors for future generations. However, it is not just about representation within industry. Providing public platforms for digital female experts and including them in discussions and media interviews is also crucial to challenge stereotypes and influence the wider public. Well-designed awareness campaigns can amplify their voices and challenge industry perceptions.

143 Interview with Senta Čermáková, CEO of Czechitas, Czechia

4. Establish a hub for mentoring initiatives and professional networks in CE/EU

Many successful programmes are already in place. It is critical to continue supporting them with (financial) means for their activities as there have been instances of some such groups discontinuing after years of successful implementation, e.g Geek Carrot Girls in Poland. However, the broader coordination of similar initiatives is often lacking in CE and the EU. A common platform for such projects and initiatives would allow for more synergies, efficient implementation, and exchange of best practices.

5. Encourage and support mothers in high-pace environment of cutting-edge technology field

Women's careers may decelerate once taking maternity leave. Therefore, it is essential to find solutions in the ecosystem, encouraging more women to be willing to re-join and progress in their career paths. This ranges from upskilling and mentoring programmes facilitating re-entry into the industry after maternity leave to caretaking facilities at companies and constant improvement of collaborative and inclusive cultures. Furthermore, national policies should also play a part. For instance, given the specific nature of maternity leave in the Czechia, which can last up to six years, policymakers should discuss various options on how to support women who (re)enter the job market. Specifically, implementing subsidised/co-financed skills development programmes tailored to mothers on maternity leave (in general), focusing on digital skills to ensure women can stay up to date with industry advancements. Additional steps can include transitioning towards reducing average maternity leave by making parental allowance conditional upon the father taking part in parental leave (as in the case of Austria) and investing in expanding the availability of formal childcare.

6. Foster feminist AI: Consult AI solutions with women of various backgrounds

AI needs diversity to provide products that will benefit all demographics. Supporting women and minorities in joining the field as stated above is one, long-term step. A solution that can be implemented in the short-term, however, could involve compulsory consultations regarding AI developments and new products with women of different age, social, educational, and ethnic backgrounds. In the CE context, it is crucial to include Romani women. These steps would enable developers to detect mistakes in their code before implementation and avoid failures such as flawed facial recognition.

7. Focus on granularity of data and updated research to keep up with the fast-moving industry

Proper investment of resources in gathering data and making it publicly available is essential for allowing the digital space ecosystem to flourish, rather than becoming dysfunctional. Currently, updated and properly disaggregated data that could provide comprehensive and timely analysis of the role of women in the digital space is lacking. If such data exists, it is not publicly available, placing a financial burden on research. Good data leads to good decisions.

Methodology

The report focuses on four CE countries: Austria, Czechia, Poland, and Slovakia. Data was collected through fieldwork, interviews, and existing research.

Fieldwork involved the screening of Instagram profiles of 20 visible and prominent women (five women per country). The analysis was conducted over a seven-day period in February 2024. Women were chosen to represent various professions, including politicians, influencers, athletes, actors, and artists. The social media platform choice was determined after pre-screening of the preferred channels of choice from the respective women, keeping in mind the current less controversial nature of some of the platforms, compared to TikTok or X, and recognizing that Instagram is growing in use, compared to Facebook and X.

The aim of the fieldwork was to collect data on the account use by the respective women, including the frequency and themes of their posts and the nature, themes, and frequency of comments. Categorisation was utilised to distinguish between positive, negative, and indifferent comments, with negative comments further sub-categorised as sexist, ideological, or competence oriented. All comments with a sexist element were deemed as negative, even if 'complimentary.'

While some interesting trends were observed, the data is not fully representative and could have been affected by the ability of users to restrict hate speech directed at them on Instagram through the platform's settings options. Future studies can benefit from comparing at least two social media channels per observed profile over a longer time scope. This would mitigate questions about sample representation constraints and event occurrence bias.

Austria

- **Karoline Edtstadler,** politician, 45.2K
- **Alma Zadić,** politician, 49.1K
- **Susanne Raab,** politician, 9.9K
- **Valentina Höll,** professional athlete, 168K
- **Valerie Huber,** musician and activist, 52.2K

Czech Republic

- **Danuše Nerudová,** politician, 159K
- **Markéta Gregorová,** politician, 8.2K
- **Johanna Nejedlova,** politician, 7.8K
- **Trang Do,** tech PR/ influencer, 19.7K
- **Olga Richterová,** politician, 11K

Poland

- **Barbara Nowacka,** politician, 110K
- **Beata Szydło,** politician, 14.6K
- **Anna Lewandowska,** sport entrepreneur, 5.6M
- **Joanna Koroniewska,** actress, 772K
- **Ilona Kostecka,** parenting blogger, 125K

Slovakia

- **Zuzana Čaputová,** politician and the President of the Slovak Republic, 494K
- **Vladimíra Marcinková,** politician, 65.8K
- **Jana Bittó Cigániková,** politician, 24.9K
- **Veronika Cifrová Ostrihoňová**, former TV editor and presenter, MEP candidate, 219K
- **Kristína Tormová,** actress, moderator, entrepreneur, writer, 143K

*number of followers as of 25.03.2024

List of interviewed women practitioners

- **Blažena Ambróz Sedrovičová,** CEO of AI Dental, Slovakia
- **Senta Čermáková,** CEO of Czechitas, Czechia
- **Lenka Hlinkova,** Founder of Ženský algoritmus/ Female Algorithm, Slovakia
- **Katerina Magnna,** Co-founder of Czech Women in AI (CWAI) and Government Affairs Lead at Microsoft Czech Republic, Slovakia and Hungary
- **Marta Kaizerova,** Head of Data Delivery Control Department, Erste Digital, Slovakia
- **Estera Kot,** Principal Product Manager at Microsoft, Poland
- **Petra Kotuliakova,** Founder of Aj ty v IT, Slovakia
- **Alicja Kwaśniewska,** Senior Principal ML Architect at SiMa.ai, Poland/USA (at the time of the interview)
- **Vanda Seidelová,** Co-Founder of Educleus & Twigsee, Czechia
- **Żaneta Świderska-Chadaj,** Professor, University of Warsaw, Poland

Notes

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