

Entry

Gender and Digital Technologies

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Definition

This entry explores the multifaceted intersections of gender and digital technologies, offering a comprehensive analysis of how structural inequalities are reproduced, contested, and transformed in digital contexts. It is structured into six interrelated sections that collectively address key dimensions of gendered digital contexts. It begins by addressing the gender digital divide, particularly in the Global South, emphasizing disparities in access, literacy, and sociocultural constraints. The second section examines gendered labor in the tech industry, highlighting persistent inequalities in Science, Technology, Engineering, and Mathematics (STEM) education, employment, and platform-based work. The third part focuses on gender representation in digital spaces, revealing how algorithmic and platform design perpetuate biases. The fourth section discusses gender bias in AI and disinformation, underscoring the systemic nature of digital inequalities. This is followed by an analysis of online gender-based violence, particularly its impact on marginalized communities and participation in digital life. The final section considers the potentials and limitations of digital activism in advancing gender justice. These sections collectively argue for an intersectional, inclusive, and justice-oriented approach to technology policy and design, calling for coordinated global efforts to create equitable digital futures.

Keywords: gender digital divide; gender representation; digital gender justice



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1. Access and the Digital Divide

Gender inequality remains a persistent global issue, manifesting across multiple dimensions—including education, employment, mobility, and access to resources. While globalization and migration have contributed to shifting gender roles in some contexts, they have not eliminated deeply embedded structural inequalities, particularly for women in the Global South [1]. These disparities increasingly extend into the digital realm, where unequal access to technology and digital skills has given rise to what is commonly referred to as the gender digital divide. This divide reflects and reinforces broader patterns of exclusion, limiting women's and marginalized gender groups' opportunities to participate fully in digital economies, education, and civic life. Understanding the digital divide through a gender lens requires examining not only disparities in access but also the social, cultural, and economic barriers that shape digital inclusion.

The gender digital divide remains a pressing issue, particularly in the Global South, where women and marginalized gender groups face significant barriers to digital access and literacy. These disparities are influenced by economic constraints, cultural norms, and infrastructural challenges, reinforcing existing gender inequalities [2,3].

Worldwide, 70% of men use the internet, while only 65% of women do, resulting in approximately 244 million fewer women online in 2023 [4]. The disparity is more pronounced in regions with low internet usage, such as Sub-Saharan Africa, where only about 30% of women use the internet compared to 40% of men [4].

In low-income countries, the disparity is even more pronounced: around 90% of adolescent girls and young women aged 15–24 are offline, compared to 78% of males in the same age group. This gap is especially significant in South Asia, with a 27 percentage point difference favoring adolescent boys and young men [5].

Mobile phones are the primary means of internet access in many low- and middle-income countries. However, women are 15% less likely than men to access the internet through mobile devices, with the gap widening to 31% in South Asia and 32% in Sub-Saharan Africa [6].

The high cost of mobile data further exacerbates the divide. In developing countries, due to high costs and connectivity challenges, 45% of women entrepreneurs do not have consistent access to the internet. Even though 92% own smartphones, broader internet access remains costly. Safety concerns persist, with 57% facing online harassment [7].

Beyond access, digital literacy remains a significant barrier. In many low- and middle-income countries, women more often than men report a lack of skills as a barrier to internet use. This skills gap limits women's ability to fully participate in the digital economy [8,9].

In Sub-Saharan Africa, the lack of digital skills among women is compounded by limited educational opportunities and cultural practices that restrict women's engagement with technology. Targeted interventions, such as digital literacy programs and microfinance initiatives, have shown promise in empowering women economically [3]. However, beyond digital skills and education, there are other structural factors that account for the gender disparity in internet use. These include the affordability of mobile phones and internet services, as well as women's lower employment rates, which limit their financial autonomy and ability to invest in technology [10]. Additionally, women's higher domestic burden—as primary caregivers within the family and often within the wider community—means they have less time and flexibility to engage regularly with the internet [10].

Cultural norms and gender roles significantly influence women's access to digital technologies. In some societies, women face restrictions on technology use due to perceptions of appropriateness or disapproval from family members. These sociocultural factors contribute to the persistent gender digital divide [2].

Addressing the gender digital divide requires comprehensive policy interventions. Strategies include investing in digital infrastructure, implementing gender-sensitive policies, and promoting digital literacy among women and girls. Initiatives like the Global Digital Compact aim to empower digital inclusion and bridge the divide [11].

In Africa, programs such as Kenya's Women Enterprise Fund and Nigeria's digital skills training initiatives have demonstrated success in enhancing women's digital engagement. Scaling these programs and ensuring their sustainability are crucial for long-term impact [3].

The gender digital divide is a multifaceted issue that perpetuates existing inequalities. While progress has been made, significant disparities remain, particularly in the Global South. Addressing this divide necessitates coordinated efforts across sectors to ensure equitable access to digital technologies and opportunities for all genders.

Accessibility is also a significant concern. While digital tools can offer greater autonomy and participation for disabled individuals, many platforms still fail to adequately meet accessibility standards. Intersectional disability justice frameworks emphasize that the digital divide must be understood not only in terms of technical access but also in terms of social inclusion and representation. Disabled people who also belong to other

marginalized groups often face compounded challenges in navigating and shaping digital environments [12].

2. Gendered Labor in the Tech Industry

A recent report by the European Commission's advisory network of experts working on the social dimension of education and training (NESET) [13], highlights a persistent challenge in STEM education: while girls often achieve equal or higher academic performance than boys in STEM subjects, they generally exhibit lower self-confidence. This difference in self-efficacy plays a significant role in shaping their willingness to pursue further studies and careers in STEM, emphasizing how critical confidence is in influencing career aspirations [14,15].

The technology sector continues to grapple with significant gender disparities, affecting employment, compensation, leadership representation, and the nature of work within both traditional and platform-based environments. Despite initiatives aimed at promoting diversity, women and non-binary individuals remain underrepresented in core STEM roles and leadership positions within the tech industry.

Women remain consistently underrepresented in STEM employment compared to men. Data from 2024 show that women make up only 28.2% of the STEM workforce, in contrast to 47.3% in non-STEM fields [16]. While there is considerable variation between countries and across different STEM fields, the gender gap represents more than just an income disadvantage for women due to limited access to STEM careers; it also signifies a missed economic opportunity and an inefficient use of labor and talent [17].

Eurostat data show that women make up only 17% of the STEM (Science, Technology, Engineering, and Mathematics) workforce across Europe, and hold just 5% of leadership positions within the technology sector [18]. This underrepresentation is compounded by systemic issues such as workplace discrimination, unequal pay, and limited advancement opportunities [19].

Digital labor practices also reflect intersectional inequalities. The gig economy, driven by platforms such as Uber, Amazon Mechanical Turk, and food delivery apps, often relies on precarious and undervalued labor. These conditions disproportionately impact women, people of color, migrants, and low-income individuals, perpetuating economic exploitation through digital means [20]. For example, studies have found that women on platforms like Amazon Mechanical Turk and UpWork earn significantly less than men [21,22]. An intersectional lens reveals how economic structures are intertwined with other identity-based oppressions in digital labor markets.

Factors contributing to these disparities include algorithmic biases, customer discrimination, and the undervaluation of traditionally feminized tasks such as translation and clerical services. Moreover, women often face additional challenges balancing platform work with domestic responsibilities, leading to reduced working hours and limited earning potential [21].

Digital labor platforms not only perpetuate gender disparities but also reinforce traditional gender roles and occupational segregation. Women are frequently channeled into tasks that mirror conventional domestic roles, such as caregiving and administrative support, which are typically undervalued and undercompensated.

The design of platform algorithms and rating systems can exacerbate these issues by embedding and amplifying societal biases. For instance, customer ratings can reflect conscious or unconscious discrimination, affecting women's access to opportunities and income. Additionally, the lack of accountability from platforms regarding worker safety and discrimination further entrenches these inequalities [23].

From a global perspective, the platform economy's impact on women varies across regions, with those in the Global South often facing compounded challenges due to socio-economic factors. Nonetheless, the overarching trend indicates that platform work tends to replicate and, in some cases, intensify existing gender-based labor disparities [24].

The tech industry's evolution, encompassing both traditional employment and the burgeoning gig economy, continues to reflect and reinforce gender-based labor disparities. Despite efforts to promote inclusivity, systemic barriers persist, limiting the participation and advancement of women and non-binary individuals. Addressing these challenges requires a multifaceted approach, including policy reforms, organizational accountability, and the redesign of platform systems to mitigate embedded biases. It is crucial to challenge the masculinized culture that still dominates technological education and professional pathways. Demasculinizing tech training not only broadens access but also fosters more inclusive and equitable innovation environments [8]. Embedding a transversal dimension of human rights and social justice into all training initiatives ensures that technological development is not only technically robust but also ethically grounded and socially responsive. Such an approach recognizes the political and cultural dimensions of technology and affirms the value of diverse knowledges and experiences in shaping a more just digital future.

3. Gender Representation in Digital Spaces

Gender representation in digital spaces constitutes a multifaceted and dynamic field, intersecting with technology, culture, and systemic structures of power. Digital platforms and virtual environments not only replicate but often intensify existing gender norms and biases, thereby shaping gender representation in ways that pose both challenges and opportunities for greater inclusivity.

Digital spaces are not neutral but are embedded within broader systems of power and inequality [25]. An intersectional perspective on digital spaces draws on analytical approaches that consider how multiple axes of identity—such as gender, race, class, sexuality, and disability—intersect to shape individuals' experiences in digital environments [26]. Rooted in intersectional feminist thought, this perspective critiques the limitations of binary gender analysis and emphasizes the need to understand how social hierarchies are reproduced and contested online. A key concern within this framework is algorithmic bias, as the algorithms that govern social media platforms, search engines, and facial recognition technologies are frequently trained on datasets that replicate existing social inequalities [27]. As a result, these systems often marginalize or misrepresent certain groups, particularly along gendered and racial lines, reinforcing the very forms of oppression that intersectionality seeks to dismantle. Applying intersectionality to digital spaces enables a more comprehensive understanding of how gender, race, class, disability, and sexuality collectively influence digital participation, representation, and exclusion [28,29].

Empirical studies have highlighted that platforms such as Twitch and Discord frequently privilege cisgender, white, heterosexual male identities, marginalizing other groups and reinforcing entrenched power dynamics [30]. These environments often reinforce prevailing cultural norms and societal inequities. Analysis of Twitch's community guidelines, for instance, indicates a disproportionate focus on regulating female-presenting bodies, problematizing and sexualizing femininity more than masculinity, thereby reflecting broader societal biases [30].

The development of virtual environments such as the metaverse introduces further ethical complexities surrounding gender and race representation. Scholars question the appropriateness of avatars representing identities different from users' own, raising concerns about cultural appropriation and the reinforcement of stereotypes [31].

Studies on platforms like ZEPETO demonstrate that avatar gender transitions can impact user identity, with female users adopting male avatars reporting enhanced avatar identification and affirmation of real-world gender identity. While virtual spaces allow exploration and redefinition of gender identities, they also risk perpetuating social hierarchies [32].

Moreover, the marginalization of women in digital spaces reflects broader societal structures that systematically render their experiences invisible or undervalued. Societal norms and gendered power relations often position women as victims of both direct and structural violence, particularly in contexts such as migration and sexual harassment [33]. Digital media, however, plays a dual role: while it can reinforce patriarchal norms, it also serves as a powerful tool for resistance and visibility. Women are increasingly using digital platforms to narrate their lived experiences, challenge dominant narratives, and mobilize support networks. These platforms offer a critical means for uncovering and confronting social injustices that might otherwise remain obscured or silenced in traditional media or public discourse [33].

Addressing the identified issues requires an integrated approach that combines regulatory measures, critical digital education, and the active inclusion of marginalized groups in technological development. Beyond symbolic representation, inclusive policies must ensure meaningful participation and the redistribution of voice and power—such as supporting underrepresented creators, funding technofeminist initiatives, and engaging affected communities [24]. These strategies are essential to reconfiguring digital spaces as genuinely inclusive and socially just environments.

4. Gender Bias in AI Systems

Artificial intelligence (AI) has become increasingly influential in shaping contemporary life, from everyday digital interactions to high-stakes decision-making systems. As its role expands, so does the need to critically examine how AI reflects and amplifies existing social biases, including those related to gender [27]. However, AI is just one example within a broader landscape of digital technologies—including social media platforms, algorithms, and data-driven tools—that also reflect and perpetuate inequalities.

Artificial intelligence (AI) systems are not inherently neutral; they reproduce the biases present in their training data and in the demographics of their development teams [34]. Language models trained on unbalanced datasets may, for instance, associate certain professions or traits with specific genders, reinforcing stereotypes [35]. Addressing such biases necessitates inclusive design, diverse development teams, balanced datasets, and robust bias detection and mitigation strategies [34].

Gender bias in AI systems manifests across all stages of development, from data collection to deployment [36]. In particular, conversational agents such as Siri and Alexa often embody gendered personas that reinforce traditional stereotypes, typically portraying assistants as female and authoritative systems as male. United Nations Educational, Scientific and Cultural Organization (UNESCO)'s report "I'd Blush If I Could" articulates concerns that such designs perpetuate the notion of women as docile and eager to please [37]. Moreover, AI systems frequently tolerate abusive language without appropriate response, further normalizing disrespect towards women [38]. Although some developers have introduced mitigations, fundamental gendered biases remain embedded within these technologies.

Reconsidering the default gendering of AI systems and integrating non-binary or gender-neutral options could help disrupt entrenched stereotypes [37].

Another important domain of gender bias is disinformation. Gender-based disinformation campaigns strategically target women, particularly those in public roles, aiming to undermine their credibility and deter their democratic participation [39]. These cam-

paings exploit gender stereotypes, portraying women as emotional or untrustworthy, thus reinforcing patriarchal norms [40]. Such disinformation campaigns harm individuals and weaken democratic institutions by deterring female participation in public life. Addressing gendered disinformation requires expanding academic research, particularly from underrepresented regions, strengthening policy measures, and promoting digital literacy as a multidimensional competence that goes beyond technical skills to include the development of critical thinking and active digital citizenship [13]. Digital literacy is crucial to empower individuals to identify and challenge embedded biases, question dominant narratives, and understand the socio-political implications of technological design and use.

A scoping review of the literature from 2013 to 2023 revealed that, despite the prevalence of gendered disinformation, scholarly research on the phenomenon remains limited, with a bias toward studies focused on the Global North [2].

5. Online Gender-Based Violence

Online safety represents another critical domain of analysis. Online harassment and gender-based violence are pervasive phenomena in digital environments, disproportionately targeting women and lesbian, gay, bisexual, transgender, queer, and other diverse sexual orientations, genders, and bodily characteristics LGBTQ+ individuals [41]. Forms of cyberviolence, including cyberbullying, cyberstalking, doxxing, and the non-consensual distribution of intimate images, reflect broader societal inequalities. Women, LGBTQ+ individuals, and racialized communities face an increased likelihood of online harassment, leading to a silencing effect whereby marginalized voices withdraw from digital discourse [41]. However, these experiences vary depending on how identities intersect. A queer woman of color, for instance, may experience online harassment that combines racism, misogyny, and homophobia. Studies have documented how online abuse contributes to digital exclusion and mental health impacts for marginalized users [42]. Structural and cultural factors, including misogynistic norms and digital platform designs that prioritize engagement over safety, exacerbate these challenges. Weak legal protections further entrench victims' vulnerability. Efforts to address these issues include policy reforms, enhanced platform moderation, public awareness campaigns, education for democratic citizenship, and support from non-governmental organizations. Comprehensive strategies are required to foster safer, more inclusive online environments [43].

Gender-based harassment is endemic in online gaming environments. A 2023 survey by Bryter found that 58% of women and girls who game have experienced toxicity from male players [44]. Similarly, Bustos-Ortega et al. [45] reported that 63.3% of women gamers had been harassed, with many concealing their gender to avoid abuse.

This hostile environment not only discourages female participation but also reinforces a culture of exclusion and gender stereotyping [46]. Women in gaming—whether as players, developers, or characters—frequently encounter objectification and discrimination, and their underrepresentation in leadership roles contributes to a lack of diverse narratives [47].

Digital spaces often reflect and amplify societal gender biases, impacting representation, participation, and safety. Across AI systems, social media, and gaming platforms, entrenched stereotypes and widespread harassment call for urgent systemic reforms. Future efforts must prioritize inclusive design, robust policy interventions, and comprehensive, diverse research to foster equitable and inclusive digital environments.

6. Digital Activism and Gender Justice

Digital activism and gender justice refer to the use of digital technologies, particularly social media platforms and online networks, to advocate for the rights, safety, and equality of women and LGBTQ+ individuals. This form of activism has transformed the

landscape of social justice movements by enabling the rapid dissemination of information, the mobilization of supporters, and the development of global solidarity networks [25].

With the rise of Web 2.0 and the proliferation of mobile internet access, digital platforms have become vital arenas for political expression and activism. Feminist and LGBTQ+ movements have increasingly leveraged these tools to raise awareness, amplify marginalized voices, and pressure institutions to address systemic inequalities. Notable examples include the #SayHerName campaign, launched in the United States [48], the #MeToo movement, which emerged in 2017 as a global callout of sexual harassment and abuse [49], and #NiUnaMenos, a Latin American movement against gender-based violence that began in Argentina and rapidly gained regional influence [50]. The #MeToo movement prompted widespread discussions about workplace harassment and power dynamics, leading to resignations, firings, and policy reforms in multiple industries. The #NiUnaMenos movement mobilized millions across Latin America against femicide and state inaction, influencing legislative changes and increasing public accountability. The #SayHerName campaign highlighted the intersection of race, gender, and police violence, expanding the Black Lives Matter movement to include the specific experiences of Black women and girls. These campaigns have illuminated the pervasive nature of sexual violence and patriarchal structures, often leading to policy debates, legal action, and broader cultural shifts [49].

Digital activism related to gender justice takes many forms. Hashtag activism plays a central role, serving as a rallying cry and linking individual stories to broader collective narratives. Hashtags democratize participation and visibility, allowing users from various backgrounds to engage in activism with minimal barriers to entry [51]. Online petitions and campaigns, facilitated through platforms such as Change.org and Avaaz, enable rapid organization and the gathering of public support for legislative or social reforms. Social media platforms and online forums provide virtual spaces for community-building, offering support, solidarity, and dialogue, particularly for individuals who live in restrictive or hostile environments. Digital storytelling through blogs, vlogs, podcasts, and short-form videos on platforms like Instagram or TikTok is another powerful tool used to share personal experiences, educate audiences, and challenge dominant narratives. In more confrontational or subversive approaches, activists may engage in hacktivism or digital protests to resist surveillance or censorship [51].

However, digital activism also faces significant challenges. One of the most pressing concerns is the backlash experienced by activists, especially women and LGBTQ+ individuals, who are frequently subjected to online harassment, trolling, threats, and doxxing [42]. Digital repression is another serious risk, as authoritarian regimes may surveil, censor, or criminalize online dissent. Activists operating in repressive contexts often face intensified dangers due to the use of digital surveillance tools, which can track, identify, and silence dissenting voices.

Additionally, algorithmic suppression poses a subtle yet powerful barrier. Algorithms on mainstream platforms may inadvertently deprioritize or hide feminist and queer content through biased content moderation or visibility practices, limiting the reach of activist messages. This can occur due to vague community guidelines, automated filtering systems, or commercial interests that favor apolitical or less controversial content [43].

There is also the issue of performative engagement—sometimes referred to as “slacktivism”—in which online participation (liking, sharing, hashtag use) does not always translate into sustained offline action or structural change [52]. While digital activism can generate widespread attention, it may also encourage superficial involvement that lacks long-term commitment or material impact. These limitations underscore the need for a critical and strategic approach to digital activism, particularly in contexts where online spaces are actively monitored or manipulated. As digital platforms become central arenas

for political contestation, activists must navigate not only opportunities for mobilization and visibility, but also the risks of co-optation, invisibilization, and surveillance.

The impacts of digital activism in gender justice are far-reaching. These digital tools have increased the visibility of gender-based violence and discrimination, connected local struggles to global audiences, and enabled decentralized, grassroots organizing outside of traditional power structures. They have also empowered young and marginalized individuals to assume leadership roles in advocacy. Scholarly research has demonstrated that digital activism can influence public discourse, shift cultural norms, and pressure institutions to respond to gender injustices [53].

The same digital tools that empower gender justice movements are also exploited by reactionary forces. Homophobic and misogynistic groups strategically use social media platforms, viral messaging techniques, and algorithmic visibility to disseminate disinformation, incite moral panic, and discredit feminist and LGBTQ+ initiatives. The spread of fake news and conspiracy theories—often targeting gender equality policies, reproductive rights, and trans inclusion—functions as a means of mobilizing backlash and reinforcing discriminatory ideologies. These tactics distort public discourse, undermine democratic debate, and endanger the safety and legitimacy of activists working toward gender justice in digital spaces [52,54].

In conclusion, digital activism plays a critical role in the ongoing struggle for gender justice. While it cannot replace the need for structural reform and in-person organizing, it complements traditional activism by offering new strategies, amplifying diverse voices, and fostering transnational solidarity. As technology evolves, so too will the tactics and terrain of feminist and LGBTQ+ activism in the digital age.

7. Future Directions and Challenges

Gender equity is fundamental to achieve a set of Sustainable Development Goals related to education, equity, peace, justice, and global citizenship, specifically SDG 4 (ensure inclusive and equitable quality education and promote lifelong learning opportunities for all), SDG 5 (achieve gender equality and empower all women and girls), SDG 10 (reduce inequality within and among countries), SDG 16 (promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels), and SDG 17 (strengthen the means of implementation and revitalize the global partnership for sustainable development) [55].

Looking ahead, achieving gender equity in the digital age requires a multidimensional and intersectional approach that addresses structural inequalities, ensures inclusive participation, and anticipates new forms of digital exclusion. As digital technologies—including artificial intelligence, immersive environments, and algorithmic governance—continue to reshape society, it is critical to develop inclusive policies that safeguard rights, promote equity, and challenge the reproduction of bias.

Ethical AI development stands at the center of these challenges. The persistence of algorithmic bias—rooted in non-representative training data, lack of diversity among developers, and opaque design processes—raises urgent concerns about fairness and accountability [27,34]. Future efforts must prioritize the inclusion of marginalized voices in technology design and governance, including women, racialized communities, people with disabilities, and LGBTQ+ individuals. Ethical frameworks should move beyond technical fixes to embrace feminist and intersectional design principles that center justice, care, and social context [29].

Equitable access to digital tools is another central concern. While global internet access is expanding, the digital divide persists along lines of gender, geography, and socioeconomic status. The gender gap in mobile internet usage remains substantial in

regions such as South Asia and Sub-Saharan Africa [6]. Addressing these disparities requires investment in gender-sensitive infrastructure, affordable access, and community-based digital literacy programs that challenge restrictive cultural norms and support women's autonomy [3,8].

Creating safer online spaces is equally vital. Digital platforms must be reimaged to prevent gender-based harassment and protect users from violence and disinformation. Current moderation systems often fail to address the complexity and intersectionality of online abuse, disproportionately affecting women, LGBTQ+ users, and racialized individuals [41,42]. Future strategies must include transparent content moderation policies, legal protections against cyberviolence, and survivor-centered support mechanisms. Moreover, platform governance must be accountable to diverse publics, rather than driven solely by engagement metrics or corporate interests [43].

Representation and participation also remain foundational. Women and non-binary people continue to be underrepresented in digital labor markets, leadership roles, and AI development teams [16,18]. Structural reforms must include quotas or affirmative measures, mentorship and leadership programs, and educational pathways that address gendered self-perceptions in STEM fields [13,15]. Equally, algorithmic systems used in hiring, lending, and policing must be subject to critical scrutiny to avoid entrenching discriminatory practices.

Finally, global governance frameworks must evolve to promote gender digital justice as a core priority. Initiatives such as the UN's Global Digital Compact and UNESCO's Ethical AI guidelines provide starting points, but sustained political will and local adaptation are essential [11,37]. Transnational collaboration should center the experiences and knowledge of actors in the Global South, whose perspectives are often marginalized in policy discourse despite facing the most acute digital inequities [2,39].

In sum, advancing gender equity in digital contexts demands an integrated approach that combines ethical innovation, inclusive governance, structural reform, and global solidarity. As technologies evolve, so must our collective efforts to ensure that digital futures are just, inclusive, and equitable for all.

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