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THE DIGITAL GENDER GAP: A SOCIOLOGICAL REVIEW OF RESEARCH AND EVIDENCE

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ABSTRACT: *The digital gender gap, referring to systematic differences between women and men in their access to, use of, skills in, participation in, and outcomes from digital technologies, represents an enduring form of inequality in modern information societies (Hattie, 2017; Williamson, 2017; Van Dijk, 2020). Although digital technologies have been widely adopted on a global scale, with connectivity infrastructures continuing to expand, gender differences in digital engagement persist in various socio-economic and cultural settings (Alexopoulos & Christopoulou, 2018; Staikou et al., 2025). While physical access to digital devices or connectivity infrastructures is not an issue, the digital gender gap refers to multi-layered inequalities, which exist at resource, competency, structural, and symbolic levels (Gee, 2007; Ertmer & Ottenbreit-Leftwich, 2013; Hattie, 2017). The present article offers an extended, theoretically informed sociological overview of existing empirical research, particularly within the last decade, with special emphasis on (1) conceptual definitions and theoretical frameworks (Williamson, 2017; Van Dijk, 2020); (2) empirical research on digital inequality patterns and typologies (Mourelatos et al., 2024); (3) structural, institutional, and cultural factors (Kakavoula et al., 2026); (4) intersections with educational paths and labor market changes (Kalogeratos & Pierrakeas, 2024); and (5) policy implications and prospects for further interdisciplinary research (Van Dijk, 2020; Theodorakopoulos et al., 2025).*

KEYWORDS: Digital gender gap, ICT, inequality.

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INTRODUCTION

Digital technologies have become an integral part of the social fabric of the contemporary world, transforming communication, economic systems, political engagement, knowledge construction, and cultural activities (Williamson, 2017; Van Dijk, 2020). From social network sites and digital labor markets to e-government initiatives and digital education systems, digital technologies play a major role in facilitating a large proportion of social interactions and economic activities (Karras et al., 2023; Kalogeratos et al., 2024). The widespread adoption of broadband internet, mobile internet, and smartphones over the last decade or so has created the illusion of continuous progress toward digital inclusion on a global level (Van Dijk, 2020). However, when we look beyond the overall level of technological penetration, we can clearly see the persistence of gender inequalities in digital engagement across different regional and socio-economic settings (Mourelatos et al., 2024; Kazianis et al., 2025).

The digital gender gap does not only encompass differences in the possession of physical devices and internet connectivity; it also extends to the acquisition of digital skills, usage confidence, rate of usage, and the translation of digital engagement into social, economic, and political benefits (Alexopoulos, 2025; Staikou et al., 2025). Women and gender minorities tend to own fewer personal devices, use shared or monitored internet access, and experience digital risks such as harassment, monitoring, and data exploitation (Van Dijk, 2020; Mourelatos et al., 2024). Although the gaps in access have decreased, qualitative differences remain in terms of usage patterns. Men are overrepresented in technical areas, high-level digital production, and profitable digital entrepreneurship, while women are more likely to engage in communicative and care-oriented online activities that are less likely to produce economic and symbolic rewards (Alexopoulos et al., 2022; Antonopoulou, 2024).

These differences cannot be explained solely in terms of technological factors. Instead, they are the result of the embeddedness of digital practices within pre-existing systems of gender stratification (Van Dijk, 2020; Alexopoulos, 2025). Gender roles and stereotypes are embedded in the social construct of gender and have been found to affect the initial socialization processes of young people and their attitudes towards technology and their own competence in dealing with it (Alexopoulos and Christopoulou, 2018; Staikou et al., 2025). Technological competence is still often symbolically coded as masculine in many societies, while care and household responsibilities that fall on the shoulders of women often hinder their opportunities and time for engaging in digital activities (Alexopoulos, 2025; Kalliampakou and Antonopoulou, 2025). In addition, economic inequalities also play a crucial role in this context, since income gaps and restricted access to financial services hinder the opportunities of women to engage in digital entrepreneurship (Van Dijk, 2020; Mourelatos et al., 2024).

Sociological thinking is essential in understanding the digital gender gap phenomenon. The sociological perspective provides an understanding of the digital divide in the context of other power relations, such as class, race, ethnicity, and marginality in terms of geographic location (Gee, 2007; Van Dijk, 2020). The use of digital technologies are not isolated from the social world but are shaped by the institutions in which they are used, which in turn reflect and reproduce the dominant values and power relations in society (Williamson, 2017; Theodorakopoulos et al., 2025). The use of algorithms in the governance of digital technologies may result in the unintentional creation of biases, which in turn can perpetuate the differences in visibility, opportunity, and representation (Van Dijk, 2020; Alexopoulos, 2025). The role of

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the state, business, and education is critical in either perpetuating or mitigating the gendered nature of the digital divide (Kalogeratos et al., 2024; Kazianis et al., 2025).

Significantly, the digital gender gap must also be seen as an intersectional issue, with gender intersecting with class, age, disability, migrant status, and rural-urban differences, which can all affect women's experiences of digital inclusion/exclusion (Alexopoulos et al., 2022). For instance, while women from affluent backgrounds in urban areas may experience high levels of digital inclusion, they may still experience exclusion in male-dominated technological fields. In addition while women from lower-income or rural areas may experience exclusion in terms of access to digital technology, restrictive gender roles, and opportunities for higher education (Van Dijk, 2020; Staikou et al., 2025). Thus, these complex dynamics, which can vary significantly depending on context, highlight the importance of moving beyond overly homogenizing discourses on digital inclusion/exclusion and instead promoting more nuanced, empirically grounded understandings (Williamson, 2017).

To sum up while digital technologies are now at the center of modern social life, their development has not led to the eradication of long-existing gender inequalities (Van Dijk, 2020). Indeed, digital society appears to reflect, and in some cases even exacerbate, existing inequalities (Alexopoulos, 2025). A fully rounded sociological approach, which encompasses analysis of cultural norms, economic stratification, institutional governance, and intersectional power relations, is necessary to fully grasp the persistence of the digital gender gap, while also informing more equitable processes of digitalization (Kazianis et al., 2025).

LITERATURE/EMPIRICAL REVIEW

Conceptualizing the Digital Gender Gap

Definitions and Dimensions

Scholars conceptualize the digital gender gap as a multidimensional phenomenon unfolding across analytically distinct yet interrelated levels of inequality (Williamson, 2017; Van Dijk, 2020). At the most fundamental level lies access, referring to the material possession of digital devices and the availability of stable, affordable, and high-quality internet connectivity (Karras et al., 2023; Mourelatos et al., 2024). Although global connectivity rates have increased significantly, gender disparities in device ownership, autonomous access, and quality of connection persist in many regions (Van Dijk, 2020; Alexopoulos et al., 2022). Access is not merely a technical condition but a socially mediated resource, shaped by household power relations, income distribution, infrastructural development, and state policy (Kalogeratos et al., 2024; Staikou et al., 2025).

Beyond material access, skills and digital literacy correspond to the second level of digital inequality (Gee, 2007; Ertmer & Ottenbreit-Leftwich, 2013). This dimension encompasses operational competencies, critical literacy, informational evaluation, and creative production (Van Dijk, 2020; Antonopoulou, 2024). Gendered disparities in digital skills often emerge from differential educational pathways, socialization processes, and exposure to STEM-related fields (Kalogeratos & Pierrakeas, 2024). Cultural narratives associating technological expertise with masculinity may undermine women’s confidence and limit engagement in advanced digital domains (Alexopoulos et al., 2022; Staikou et al., 2025).

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The third level concerns usage patterns and outcomes, focusing on the capacity to translate digital engagement into meaningful social, economic, and political benefits (Williamson, 2017; Van Dijk, 2020). Usage includes communication, entrepreneurship, civic participation, and knowledge production (Kazianis et al., 2025). Gender disparities at this level are significant, with women overrepresented in low-return digital activities and underrepresented in high-reward sectors such as technological innovation and digital entrepreneurship (Antonopoulou, 2024). The transition from access to substantive engagement remains uneven, highlighting the need to address structural and cultural barriers simultaneously (Van Dijk, 2020; Staikou et al., 2025).

Sociological Perspectives

Social theorists challenge technologically deterministic perspectives, arguing that technology is socially constructed and embedded within relations of power and institutional practice (Gee, 2007; Williamson, 2017). Digital architectures, algorithms, and platforms reflect the priorities of dominant social groups (Van Dijk, 2020; Alexopoulos, 2025). Gendered experiences with technology are shaped by patriarchy, capitalism, and class stratification (Alexopoulos et al., 2022; Kazianis et al., 2025). Patriarchal norms reinforce occupational segregation in STEM fields, shaping patterns of digital confidence and participation (Alexopoulos, 2025; Staikou et al., 2025). Capitalist logics organize digital labor markets in ways that reproduce wage inequalities and precarious employment (Williamson, 2017; Van Dijk, 2020). Class stratification intersects with gender to condition access to education, training, and economic capital for digital engagement (Alexopoulos et al., 2022; Kalogeratos & Pierrakeas, 2024).

Patterns of Digital Inequality: Empirical Evidence

Global Access and Connectivity

Recent international assessments continue to document persistent gender disparities in internet use and device ownership, despite overall growth in global connectivity (Van Dijk, 2020). According to data published by the International Telecommunication Union, women remain significantly less likely than men to access and use the internet worldwide, with an estimated 244 million fewer women than men online in 2023. While the global gender gap has narrowed in some middle- and high-income contexts, it remains particularly pronounced in low-income countries and among younger age cohorts aged 15–24, where digital access increasingly shapes educational attainment, employment prospects, and social participation (Williamson, 2017; Mourelatos et al., 2024). These disparities indicate that aggregate improvements in infrastructure and smartphone penetration do not automatically translate into equitable inclusion, especially where structural inequalities persist (International Telecommunication Union [ITU], 2023; UNESCO, 2023; World Bank, 2023; GSMA, 2024)

In Sub-Saharan Africa, gendered differences extend beyond connectivity to encompass disparities in digital skills and functional literacy (Van Dijk, 2020). The proportion of women possessing competencies such as spreadsheet use, online information management, or advanced digital fluency remains substantially lower than that of men. Such inequalities are shaped by a constellation of interrelated factors, including restrictive gender norms that limit mobility and educational opportunities, disproportionate care responsibilities, high relative costs of devices and data plans (Kalogeratos & Pierrakeas, 2024), and concerns about online harassment and safety (Mourelatos et al., 2024). In many contexts, digital exclusion is reinforced by household power dynamics that prioritize male access to shared technological

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resources (Kazianis et al., 2025). Consequently, digital inequality in the region reflects not only infrastructural deficits but also entrenched socio-cultural and economic constraints that systematically disadvantage women and girls (Van Dijk, 2020).

Digital Literacy and Skills

Empirical research highlights that gender disparities in digital inclusion are not uniform across all domains of competence but instead manifest in differentiated patterns of digital skills acquisition and performance (Ertmer & Ottenbreit-Leftwich, 2013; Kalliampakou & Antonopoulou, 2025). Evidence from Indonesia, for example, indicates that men exhibit, on average, higher levels of digital literacy than women, particularly among older cohorts. These disparities are often interpreted as the cumulative outcome of historically gendered educational trajectories, unequal labor market participation, and differential exposure to technological environments over the life course (Antonopoulou, 2024a; Antonopoulou, 2024b). Older women, who may have had more limited access to formal education and fewer opportunities for technology-related training, are especially likely to experience disadvantages in operational and informational digital skills (Kalogeratos et al., 2024). Such findings underscore the importance of adopting a life-course perspective in analyzing the digital gender gap, as inequalities are frequently sedimented over time through intersecting social and institutional processes.

In Europe, comparative research conducted across four countries reveals a more nuanced and context-dependent picture. While girls often demonstrate strong performance in Computer and Information Literacy (CIL), particularly in tasks related to information management and critical evaluation (Kalogeratos & Pierrakeas, 2024), boys tend to outperform girls in Computational Thinking (CT), which involves algorithmic reasoning, coding-related logic, and problem-solving in abstract digital environments (Gee, 2007; Kalogeratos, Anastasopoulou, & Pierrakeas, 2023). These differentiated outcomes suggest that gendered patterns of competence are shaped not only by individual aptitude but also by curricular design, pedagogical practices, cultural stereotypes, and national educational systems (Kalogeratos et al., 2024; Kalogeratos et al., 2025). Consequently, the digital gender gap cannot be conceptualized as a singular or homogeneous deficit; rather, it varies by skill type, institutional setting, and socio-cultural context, requiring carefully tailored policy and educational interventions (Kalogeratos et al., 2025).

Sociological Drivers of the Digital Gender Gap

Gendered Socialization and Technology Cultures

Sociological literature consistently underscores the formative role of gendered socialization in shaping patterns of technological engagement from early childhood onward (Alexopoulos & Christopoulou, 2018; Kakavoula et al., 2026). Family environments, peer interactions, media representations, and educational practices contribute to the construction of technology as a domain culturally coded as masculine (Gouvias & Alexopoulos, 2018; Nikolopoulos & Alexopoulos, 2025). Historically, boys have been more frequently encouraged to experiment with computers, video games, and technical problem-solving activities, while girls have often been steered toward communicative or care-oriented uses of technology (Alexopoulos et al., 2022). These early experiences cultivate differential levels of self-efficacy, confidence, and identification with technical competence (Antonopoulou, 2024b; Kalogeratos, Anastasopoulou, & Pierrakeas, 2024). Over time, such patterned expectations become

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institutionalized through subject choices in secondary education, participation in extracurricular STEM activities, and eventual career trajectories, thereby reinforcing cumulative inequalities in digital expertise (Kalogeratos et al., 2025; Kalliampakou & Antonopoulou, 2025).

Importantly, empirical evidence indicates that even in contexts where formal access to devices and connectivity appears relatively equal, qualitative differences in usage persist. Men, on average, tend to engage with digital tools more intensively and across a broader range of instrumental tasks, including online job search, financial management, investment activities, technical troubleshooting, and content creation (Kalogeratos et al., 2025; Karras et al., 2025). Women, by contrast, are often more concentrated in communicative and relational uses, such as social networking or maintaining family connections (Van Dijk, 2020). These distinctions are socially structured, reflecting differential expectations, time constraints linked to unpaid care work, and varying levels of encouragement to explore advanced technological functions (Alexopoulos, 2025; Staikou et al., 2025). Consequently, gendered patterns of use contribute to unequal digital outcomes, as instrumental and production-oriented engagement is more likely to generate economic returns and professional advantages (Williamson, 2017).

Intersectionality: Gender, Class, and Citizenship

Contemporary research increasingly adopts an intersectional framework to analyze digital inequality, emphasizing that gender does not operate in isolation but interacts dynamically with social class, age, migration status, ethnicity, disability, and geographic location (Van Dijk, 2020; Mourelatos et al., 2024). These intersecting axes of identity and structural position shape not only access to digital technologies but also the conditions under which individuals engage with them and the benefits they are able to derive (Kazianis et al., 2025; Kakavoula et al., 2026). For instance, women's digital practices are frequently structured by disproportionate caregiving responsibilities and chronic time poverty. These constraints limit opportunities for sustained skill development or participation in economically strategic online activities (Kalogeratos et al., 2024). As a result, patterns of engagement may be oriented more toward relational maintenance, coordination of household tasks, or community communication rather than toward professional networking, digital entrepreneurship, or advanced technical training (Alexopoulos et al., 2022; Alexopoulos, 2025). Such patterns reflect broader gendered divisions of labor rather than individual preferences.

An intersectional approach, therefore, reveals that digital inclusion policies cannot be effectively designed through a singular focus on gender parity in access statistics (Van Dijk, 2020; Mourelatos et al., 2024). Instead, they must address the broader socio-economic and institutional inequalities that shape lived digital experiences. Policies aimed at expanding connectivity, for example, may have limited impact if they do not simultaneously confront barriers related to income inequality, precarious employment, restrictive migration regimes, educational disparities, and inadequate childcare provision (Kalogeratos et al., 2024; Kalogeratos et al., 2025). By situating the digital gender gap within a matrix of interlocking structural constraints, intersectional analysis underscores the necessity of comprehensive, context-sensitive interventions that seek not merely to integrate women into existing digital systems, but to transform the social conditions that systematically circumscribe their participation and agency (Williamson, 2017; Van Dijk, 2020).

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Economic and Structural Barriers

Affordability, particularly the cost of mobile data, remains a significant constraint for women, especially in developing contexts (Kalogeratos et al., 2024; Kalogeratos et al., 2025). The high cost of connectivity limits women's ability to engage meaningfully with digital markets, social networks, and online services, reinforcing gendered economic disadvantages (Kalliampakou & Antonopoulou, 2024; Antonopoulou, 2024a). Digital financial inclusion initiatives, such as mobile banking or subsidized internet programs, are critical to reducing structural barriers and fostering equitable participation (Alliance for Affordable Internet, 2023; Kalogeratos et al., 2024; Mourelatos et al., 2024; UNCTAD, 2024; World Economic Forum, 2024).

Education and the Gendered Tech Pipeline

Schooling and Digital Education

Education systems play a critical role in shaping digital trajectories (Kalogeratos & Pierrakeas, 2021; Kalogeratos & Pierrakeas, 2024). While girls may show competence in general digital literacy, they continue to be underrepresented in STEM and computing disciplines, partly due to gender stereotypes and educational cultures that influence subject choice and confidence (Alexopoulos et al., 2022; Alexopoulos, 2025). The attitude toward technology, a socially mediated construct, is a key factor: evidence suggests that differences in technology attitudes partially explain gaps in skills and proficiency (Ertmer & Ottenbreit-Leftwich, 2013; Gee, 2007).

Early exposure to digital tools and structured learning experiences, such as coding workshops, computational thinking exercises, and gamified STEM projects, can improve confidence and skill acquisition among female students (Antonopoulou, 2024a; Antonopoulou, 2024b; Kalliampakou & Antonopoulou, 2024). Nevertheless, gendered classroom dynamics, societal expectations, and limited role models in technical fields often undermine girls' sustained engagement with digital learning (Kalogeratos et al., 2023; Kalogeratos et al., 2024). Integrating inclusive pedagogical practices and mentorship programs has been shown to promote both interest and self-efficacy in digital domains (Kalogeratos et al., 2025; Antonopoulou, 2024a).

Gendered Career Pathways

Even when technical education is accessible, structural and economic constraints shape career trajectories. Affordability, particularly the cost of mobile data, devices, and subscription services, remains a critical barrier to digital inclusion for women, especially in low- and middle-income countries (Kalogeratos et al., 2024; Kalliampakou & Antonopoulou, 2025). Women in these contexts often face lower incomes, informal employment, and limited household decision-making power over financial resources, which restricts sustained engagement with digital tools (Kalogeratos et al., 2024; Mourelatos et al., 2024). Intermittent access, shared devices, and limited data plans constrain privacy, continuity of use, and opportunities for skill development (Kalogeratos et al., 2024; Kalogeratos et al., 2025).

The digital gender gap also influences professional pathways. Women are less likely to enter high-reward technological sectors, digital entrepreneurship, or data-intensive professions, even if they possess foundational skills (Alexopoulos, 2025; Staikou et al., 2025). Structural and cultural barriers, including workplace bias, male-dominated networks, and stereotype threat,

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compound these limitations (Van Dijk, 2020; Williamson, 2017). Addressing gendered career disparities requires holistic interventions that combine skill development, mentorship, access to resources, and structural reforms in education and employment (Kalogeratos et al., 2025; Karras et al., 2025).

Programs that emphasize early exposure to STEM, gamification, digital literacy, and applied project-based learning can mitigate these gaps (Antonopoulou, 2024b; Kalogeratos et al., 2023; Kalogeratos et al., 2024). Moreover, intersectional considerations, such as socioeconomic status, rural or urban residence, and migration background, are critical to ensure that initiatives effectively reach and support diverse groups of female students (Mourelatos et al., 2024; Van Dijk, 2020). Policies and practices that integrate these dimensions can enhance participation, confidence, and long-term engagement, thereby promoting more equitable outcomes in the tech pipeline (Alexopoulos et al., 2022; Kakavoula et al., 2026).

In conclusion, the educational system functions as both a site of reproduction and potential disruption of digital gender inequalities. By addressing gendered socialization, providing equitable access to digital learning, and creating supportive pathways into STEM and technology careers, education can serve as a lever to reduce the digital gender gap and empower women to participate fully in the emerging digital economy (Kalogeratos et al., 2024; Antonopoulou, 2024a; Kalliampakou & Antonopoulou, 2025).

Sociological Consequences of the Digital Gender Gap

Economic Inequality and Participation

Digital exclusion functions not merely as a technological deficit but as a mechanism that amplifies and reproduces broader socio-economic inequalities (Van Dijk, 2020; Williamson, 2017). As economic, educational, and governmental activities become increasingly digitized, limited access to and engagement with digital infrastructures systematically constrain women's opportunities for advancement (Alexopoulos, 2025; Staikou et al., 2025). Women's comparatively lower levels of participation in digital markets, whether in e-commerce, remote work platforms, or digitally mediated supply chains, translate into reduced income-generating possibilities and diminished entrepreneurial visibility (Mourelatos et al., 2024; Karras et al., 2023).

In contexts where small-scale enterprises rely heavily on online marketing, digital payment systems, and platform-based distribution, exclusion from these channels places women at a structural disadvantage relative to male counterparts who are more fully integrated into digital ecosystems (Karras et al., 2025; Giotopoulos et al., 2024). Moreover, restricted access to digital financial tools, including mobile banking, online credit services, digital savings platforms, and fintech applications, limits women's capacity to accumulate capital, manage financial risk, and build economic resilience (Kazianis et al., 2025; Van Dijk, 2020). Digital financial inclusion has been associated with enhanced autonomy, improved household bargaining power, and greater participation in formal economic systems (Kalogeratos et al., 2024; Kalogeratos et al., 2025). When women are excluded from these technologies, existing disparities in asset ownership, credit access, and business development are reinforced (Kalliampakou & Antonopoulou, 2025; Mourelatos et al., 2024).

Autonomy, Agency, and Social Capital

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Digital platforms have become central arenas for social interaction, civic engagement, and the formation of social capital (Williamson, 2017; Van Dijk, 2020). They provide avenues for networking, knowledge exchange, community organization, and participation in public discourse. However, gendered disparities in digital access and competencies constrain women's ability to fully leverage these opportunities (Alexopoulos et al., 2022; Staikou et al., 2025). Limited access to devices, connectivity, and advanced digital skills can restrict the frequency, scope, and strategic orientation of women's online engagement, reducing their capacity to participate in collaborative initiatives, professional networks, or digitally mediated advocacy efforts (Alexopoulos, 2025; Mourelatos et al., 2024).

These structural constraints affect not only individual connectivity but also the collective capacity of women to influence social and political processes within digital environments (Van Dijk, 2020; Mourelatos et al., 2024). Furthermore, the implications of digital exclusion extend to political and cultural empowerment. Women who are constrained in their ability to navigate digital platforms may experience diminished visibility, reduced opportunities for political mobilization, and limited participation in online deliberation or civic campaigns (Mourelatos et al., 2024; Vasilopoulos et al., 2023). Digital literacy and platform familiarity are increasingly prerequisites for exercising forms of digital citizenship, from petitioning and advocacy to participation in policy debates and cultural production (Van Dijk, 2020; Williamson, 2017).

Online Safety, Security, and Differential Risks

Empirical studies reveal that gender significantly shapes experiences of online safety and the strategies employed to navigate digital risks (Van Dijk, 2020; Staikou et al., 2025). Women are often more reliant on informal social networks, family, friends, and peer communities for guidance on safe digital practices, rather than engaging directly with formal privacy and security technologies (Alexopoulos et al., 2022; Alexopoulos, 2025). This reliance reflects not only gaps in digital literacy and confidence with technical tools but also structural constraints, such as limited access to cybersecurity training or resources tailored to women's specific needs (Vasilopoulos et al., 2023; EIGE, 2023; ITU, 2023; Karras et al., 2023; UN Women, 2024).

Patterns of online engagement, including frequency of use and types of platforms accessed, further influence exposure to risks such as harassment, scams, or data misuse, creating a complex landscape in which safety behaviors are both socially mediated and technically constrained (Van Dijk, 2020; Staikou et al., 2025). These gendered patterns of online safety are deeply intertwined with broader cultural norms surrounding risk, trust, and technology (Alexopoulos, 2025; Mourelatos et al., 2024). Social expectations often position women as more cautious or responsible for managing relational risks, reinforcing tendencies to seek guidance from trusted personal networks rather than experiment with technical safeguards independently (Alexopoulos et al., 2022; Van Dijk, 2020). Simultaneously, men are more likely to adopt proactive engagement with privacy technologies or technical workarounds, reflecting cultural associations of technological competence with masculinity (Williamson, 2017; Van Dijk, 2020).

Such dynamics demonstrate that online safety is not purely a matter of individual choice or capability, but a socially constructed phenomenon shaped by intersecting norms, institutional supports, and access to knowledge (Alexopoulos, 2025; Staikou et al., 2025). Gender-sensitive digital literacy and security interventions are essential to ensure equitable access and mitigate structural disadvantages (Kalliampakou & Antonopoulou, 2025; Van Dijk, 2020).

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Policy Frameworks and Interventions

Inclusive Digital Education

Effective policy responses to the digital gender gap require interventions that go beyond simply expanding access to technology, focusing instead on the cultivation of skills, confidence, and agency in digital environments (Alexopoulos et al., 2022; Van Dijk, 2020). Integrating gender-sensitive digital curricula within educational systems is a crucial strategy (Kalogeratos et al., 2024; Kalogeratos et al., 2025). Such curricula should not only teach operational and technical competencies but also emphasize critical digital literacy, creative production, computational thinking, and problem-solving skills, while actively challenging gendered stereotypes about technology (Alexopoulos, 2025; Mourelatos et al., 2024).

By creating learning environments that encourage girls and gender-marginalized students to experiment, take risks, and engage in collaborative digital projects, educational institutions can foster early familiarity with technology and reduce confidence gaps that often persist into adulthood (Gee, 2007; Ertmer & Ottenbreit-Leftwich, 2013). Complementing curricular reforms, mentorship programs and targeted interventions are essential to support sustained engagement and build self-efficacy in digital domains (Antonopoulou, 2024a; Antonopoulou, 2024b). Mentorship initiatives that connect young women with role models in STEM, digital entrepreneurship, and online innovation can provide guidance, networks, and social validation that reinforce participation (Kalogeratos et al., 2024; Kalliampakou & Antonopoulou, 2024). Additional interventions such as workshops, digital bootcamps, and confidence-building programs can address psychological and social barriers, including fear of failure, imposter syndrome, and limited exposure to technical role models (Kalogeratos et al., 2024; Antonopoulou, 2024a). Together, these policies create an enabling ecosystem that not only equips women with digital skills but also empowers them to navigate online spaces strategically, translate their digital engagement into economic and social benefits, and challenge the structural inequities that contribute to the persistence of the digital gender gap (Van Dijk, 2020; Williamson, 2017).

Structural Access Initiatives

Addressing material barriers to digital inclusion requires policies that make connectivity and devices more accessible and affordable, particularly for women in underserved or economically marginalized communities (Kazianis et al., 2025; Karras et al., 2025). Subsidies for internet access and mobile data can help lower the financial threshold for participation, enabling consistent and autonomous engagement with digital tools (Kalogeratos et al., 2024; Kalogeratos et al., 2025). Similarly, targeted distribution of devices, such as low-cost smartphones, tablets, or laptops, ensures that women who might otherwise be excluded from digital participation gain the necessary hardware to access online resources, educational platforms, and economic opportunities (Giotopoulos et al., 2024; Karras et al., 2023). These interventions are especially critical in regions where household incomes are low, digital infrastructure is limited, or traditional gender norms restrict women's independent access to technology (Mourelatos et al., 2024; Van Dijk, 2020).

Beyond affordability, community-based digital centers provide localized spaces where women can develop skills, receive guidance, and engage safely with digital technologies (Kalogeratos et al., 2024; Kalogeratos et al., 2025). Such centers often combine access to devices and connectivity with structured training programs, mentorship, and peer support, creating an

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environment that fosters both competence and confidence (Antonopoulou, 2024b; Kalliampakou & Antonopoulou, 2025). By situating digital inclusion initiatives within community settings, these programs can address social as well as technical barriers, such as mobility restrictions, caregiving responsibilities, and limited social networks (Kalogeratos et al., 2024; Staikou et al., 2025). Collectively, subsidies, targeted device programs, and community digital centers represent complementary strategies that reduce structural barriers, enhance equitable access, and enable women to participate more fully in economic, social, and civic digital spaces (Van Dijk, 2020; Alexopoulos, 2025).

Intersectional Policy Design

Gender inclusion strategies in digital policy must adopt an intersectional framework, recognizing that women's experiences with technology are shaped not only by gender but also by interlocking social categories such as class, age, ethnicity, and migration status (Alexopoulos et al., 2022; Mourelatos et al., 2024). These intersecting factors influence access to devices and connectivity, opportunities for skill development, patterns of digital use, and exposure to online risks (Van Dijk, 2020; Staikou et al., 2025). For example, young women from low-income households may face compounded barriers due to limited financial resources and restricted educational opportunities, while migrant women might encounter additional language, cultural, or regulatory obstacles that constrain digital participation (Kazianis et al., 2025; Karras et al., 2025). Without attention to these intersecting inequalities, policies risk benefiting only the most privileged groups and leaving structurally marginalized women further behind (Alexopoulos, 2025; Mourelatos et al., 2024).

Adopting an intersectional approach enhances the reach and effectiveness of digital inclusion efforts by ensuring interventions are context-sensitive and responsive to diverse needs (Van Dijk, 2020; Williamson, 2017). Programs that account for multiple axes of disadvantage can tailor curricula, mentorship, training, and access initiatives to specific communities, thereby improving uptake and impact (Kalogeratos et al., 2024; Kalliampakou & Antonopoulou, 2024). For instance, community-based digital centers in rural areas may incorporate multilingual instruction and flexible hours to accommodate both ethnic diversity and caregiving responsibilities (Kalogeratos et al., 2024; Antonopoulou, 2024a). By foregrounding the complex ways in which structural inequalities shape digital experiences, intersectional strategies not only promote gender equity but also advance broader social inclusion, ensuring that digital transformation benefits all segments of society rather than reinforcing existing hierarchies (Van Dijk, 2020; Alexopoulos, 2025).

CONCLUSION

In this regard, the digital gender gap is a complex social phenomenon that is an expression of fundamental inequalities in cultural, economic, educational, and institutional spheres (Alexopoulos, 2025). Thus, the digital gender gap is not only an expression of inequalities in the availability of digital devices or connectivity tools but also an expression of inequalities in digital literacy, digital use, online safety, and the capacity to benefit socially, economically, and politically from digital engagement (Williamson, 2017). Such cultural, economic, educational, and institutional inequalities, in which technical competency is equated with masculinity, women's economic autonomy is undermined, and boys and girls are socialized to

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acquire different skills, are important in the maintenance of the digital gender gap (Alexopoulos et al., 2022; Mourelatos, 2024).

In this regard, sociological theories have demonstrated the need for the development of holistic strategies to address the digital gender gap, going beyond the mere provision of technical devices (Kalogeratos, 2024; Kazianis, 2025). Such strategies need to take into account the educational, mentoring, affordability, and safety dimensions of digital engagement, as well as the structural inequalities in caregiving, work, and socio-economic marginalization (Alexopoulos, 2025; Staikou, 2025). Such an intersectional approach is critical in the development of strategies that take into account the complexity of women's and gender-marginalized groups' experiences in different socio-economic, cultural, age, and migration groups (Van Dijk, 2020; Mourelatos, 2024). In this regard, the development of strategies within the broader context of social justice and women's empowerment is critical in the development of an environment in which women's engagement in the digital sphere is meaningful, sustained, and socially and economically rewarding (Alexopoulos et al., 2022; Williamson, 2017).

Future studies should also focus on the dynamic and constantly changing aspects of digital inequality and how emerging technologies such as artificial intelligence and algorithmic decision-making are affecting and will continue to affect access and social participation in the future (Karras et al., 2025; Van Dijk, 2020). In addition, future studies should also focus on the evaluation of policy interventions and strategies that have been put in place to reduce the digital gender gap and how these have impacted the social inequalities that exist (Kalogeratos et al., 2023; Mourelatos et al., 2024; Kalogeratos et al., 2024). The digital gender gap is not only a product of social inequalities but also a contributor to social inequalities in the future. In conclusion, the digital gender gap is not only a product of social inequalities but also a contributor to social inequalities in the future. In addition, the digital gender gap can only be resolved and social inequalities mitigated through comprehensive and multifaceted approaches that involve policy interventions and strategies that are aimed at ensuring that future generations are not only aware of the benefits of emerging technologies but also have access to these emerging technologies and can participate in the opportunities that are available in the future (Van Dijk, 2020; Alexopoulos et al., 2022; Williamson, 2017).

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