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Women in Cyberspace: A Public Policy Perspective Towards Achieving Viksit Bharat

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Abstract:
Digital divide is an established concept of the differential access to digital resources. However, the concept has emerged to include the second and the third levels of digital divide – the possession of digital skills and the ability to gain meaningful outcomes from the participation in digital sphere. Thus, digital divide has become a wholesome concept to include access, skills and outcome. Cyberspace is the digital "public sphere" which offers the opportunity to network and enjoy all the fundamental human rights. But, it has also been the medium of exclusion, discrimination and harassment for women. Cyberspace as a digital public sphere has to be accessible, safe and provide equal opportunity to all. This paper examines the experiences of women in the cyberspace in terms of access, skill and tangible outcomes from an intersectionalist perspective utilizing the theories of inequality. It adopts a mixed-method approach utilizing both the survey based quantitative method and interview based qualitative method. It is obtained that the social inequalities not only reinforce but also exacerbates the digital inequalities. Thus, from a policy perspective it becomes crucial that a gender lens be adopted to overcome the existing social inequalities in the cyberspace. Only then, we can fulfill the dream of Viksit Bharat in this digital century.

Keywords: Digital divide, digital inequality, social inequalities, gender, skill, Viksit Bharat

1. Introduction

Twenty-first century has seen tremendous digital transformation and changed ways as to how societies function, communicate, and progress. In India's developmental journey, the role of women in cyberspace has emerged as a critical determinant of inclusive growth and societal transformation. This research examines the multifaceted dimensions of women's participation in digital spaces through empirical evidence and theoretical frameworks, exploring how digital inclusion can accelerate development while addressing persistent gender disparities.

The digital landscape in India presents opportunities and challenges. Analyzing ICT adoption patterns, Best and Maier (2007) found significant gender-based disparities in rural South India, where cultural norms and social structures heavily influence technology access and usage. Their empirical research demonstrates how traditional power structures often translate into digital spaces, creating what Warschauer (2004) terms "social stratification in the digital age." Supporting this analysis, Antonio and Tuffley (2014) documented how the gender digital divide in developing countries operates at multiple levels - access, skills, and meaningful usage. Their research across six nations revealed that women face barriers to digital participation, findings that align with Kularski and Moller's (2012) argument that digital divides exacerbate traditional inequalities. The emergence of artificial intelligence and

algorithmic decision-making systems has added new dimensions to this discourse. As India positions itself as a global technology hub, the underrepresentation of women in AI development and deployment raises critical concerns about algorithmic bias and the perpetuation of gender stereotypes in digital spaces. This gender imbalance in AI development has profound implications for the creation of inclusive digital solutions that can effectively serve diverse population segments.

The theoretical underpinning for understanding women's digital participation draws from several established frameworks. Castells' (2010) network society theory provides a crucial foundation for understanding how digital networks reshape social relationships and power structures. This perspective is enriched by van Dijk's (2020) analysis of successive levels of digital divide, demonstrating how access, skills, and usage patterns create cumulative advantages or disadvantages. Gillwald et al. (2010) contribute valuable insights through their comprehensive gender assessment of ICT access and usage, establishing methodological frameworks for understanding multidimensional aspects of digital exclusion. Their research demonstrates how socio-economic factors intersect with gender to create unique patterns of digital marginalization.

Sen's (1999) capability approach provides a powerful framework for understanding how digital access and skills can expand women's freedoms and opportunities. This theoretical perspective is empirically supported by Balasubramanian et al.'s (2010) study of mobile learning initiatives among rural women in Southern India, which demonstrated how digital tools can enhance women's capabilities when properly contextualized. Building on this foundation, Masika and Bailur (2015) examined how women negotiate agency through ICTs, revealing complex patterns of empowerment and constraint. Their comparative study of Uganda and India provides valuable insights into how digital technologies can either challenge or reinforce existing gender norms.

The economic dimensions of digital inclusion are thoroughly examined by Oreglia and Srinivasan (2016), who documented how digital intermediaries can transform gendered power structures in rural economies. Their research reveals how women's digital participation can create new economic opportunities while challenging traditional market hierarchies. Huyer and Mitter's (2003) seminal work on gender dimensions of the knowledge society establishes crucial frameworks for understanding how digital skills translate into economic opportunities. Their analysis is complemented by Venkatesh and Morris's (2000) research on gender differences in technology acceptance, which reveals how social influence shapes women's technology adoption patterns.

Examining institutional responses, Rao's (2009) analysis of ICTs in India's rural community information systems provides valuable insights into policy implementation challenges. This is supplemented by Gurumurthy's (2004) comprehensive framework for gender-responsive ICT policies, which emphasizes the need for integrated approaches to digital inclusion. Livingstone and Helsper's (2007) concept of "gradations of digital inclusion" provides a nuanced framework for policy development, suggesting that interventions must address multiple levels of digital engagement. This aligns with Robinson et al.'s (2015) findings on why digital inequalities matter for social inclusion and economic opportunity.

The concept of Viksit Bharat encompasses not just economic growth but holistic societal development, where women's digital empowerment plays a pivotal role. The theoretical framework of "capability approach" developed by Sen and Nussbaum provides valuable insights into how digital access and skills can expand women's freedoms and opportunities. Digital literacy becomes not just a technical skill but a fundamental capability that enhances women's agency in economic, social, and political spheres. India's digital transformation initiatives, particularly the Digital India programme, have created a robust

foundation for expanding digital access. However, the success of these initiatives in achieving gender-inclusive development depends on addressing what van Dijk (2023) terms the "second-level digital divide" – the gap in digital skills and meaningful usage patterns. This research argues that public policy must evolve beyond access-centric approaches to encompass comprehensive digital capacity building, the ability to not just use but meaningfully engage with and shape digital technologies.

Looking forward, this research aims to contribute to understanding how digital inclusion can support comprehensive development goals. Drawing from Rashid's (2016) comparative analysis of digital inclusion across developing countries, we examine how policy frameworks can address both technological and social barriers to women's digital participation.

2. Literature Review

The literature on women's participation in cyberspace and digital empowerment has evolved significantly over the past two decades, moving from binary conceptualizations of access to more nuanced understandings of digital inclusion and empowerment.

Early theoretical frameworks, exemplified by Warschauer's (2004) seminal work, established that the digital divide extends beyond mere access to technology. This understanding was further developed by Livingstone and Helsper (2007), who introduced the concept of "gradations of digital inclusion," arguing that digital exclusion operates on multiple levels. Their work was instrumental in shifting the discourse from simple binary models to more sophisticated understandings of digital inequality. Building on these foundations, van Deursen and Helsper (2015) introduced the third-level digital divide framework, highlighting how different forms of internet use create varying levels of benefit. This theoretical advancement was crucial in understanding why providing access alone doesn't guarantee meaningful digital participation. Robinson et al. (2015) further enriched this understanding by demonstrating how digital inequalities intersect with and potentially amplify existing social disparities. In the Indian context, in Sheriff (2020) National Family Health Survey data (NFHS 2019-21) show a clear gender gap in internet use, with women's use markedly lower than that of men across states. revealing how regional and cultural variations influence digital participation patterns. Similarly, in MoSPI (2025) National Sample Organisation survey provides recent data on mobile and internet usage, including gendered differences in digital access and ICT skills among the Indian population. Their work complements Kularski and Moller's (2012) argument that digital divides represent continuations of traditional systems of inequality.

Research on technology adoption patterns reveals complex interactions between gender, culture, and technology use. Best and Maier's (2007) study in rural South India provided early insights into how cultural norms influence women's ICT adoption. Their findings were later reinforced by Antonio and Tuffley (2014), who identified specific barriers to women's technology adoption in developing countries. Venkatesh and Morris's (2000) influential work on gender differences in technology acceptance laid the groundwork for understanding how social influence affects women's technology usage. This was further developed by Hilbert (2011), who challenged simplistic narratives about gender and technology, demonstrating how women often show higher adoption rates when controlling for employment and education. Rashid's (2016) comparative study across five developing countries revealed how social and economic factors intersect with gender to influence ICT access and use. This work was complemented by Barboni et al.'s (2018) comprehensive study of mobile phone adoption among Indian women, which identified specific barriers including cost, digital literacy, and social norms.

The relationship between digital inclusion and economic empowerment has been extensively studied. Bailur, Masiero, and Tacchi (2018) demonstrated how mobile technologies can create new economic opportunities for women. Their work builds on Huyer and Mitter's (2003) earlier research on the gender dimensions of the knowledge society. Masika and Bailur (2015) provided valuable insights through their comparative study of Uganda and India, showing how women negotiate agency through ICTs. This theme was further explored by Oreglia and Srinivasan (2016), who examined how digital intermediaries can transform gendered power structures. Gillwald, Milek, and Stork's (2010) comprehensive assessment of ICT access and usage in Africa provided valuable methodological frameworks for understanding gender-based digital exclusion, which have been applied in other contexts, including India.

The policy dimension of digital inclusion has received significant attention. Balasubramanian et al. (2010) documented successful mobile-based learning initiatives in Southern India, demonstrating how targeted interventions can promote women's digital literacy. Gurumurthy's (2004) overview report established essential frameworks for gender-responsive ICT policies. Martinez and Nguyen (2014) analyzed how ICT policies can support women's entrepreneurship, while Rao (2009) examined the specific role of ICTs in India's rural community information systems. Wamala's (2012) work on ICT-based women's empowerment provided valuable insights into policy implementation strategies.

The literature reveals several areas requiring further investigation. First, while considerable research exists on access-related barriers, more studies are needed on how women navigate digital spaces once access is achieved. Second, the long-term impacts of digital inclusion initiatives on women's economic and social empowerment require longitudinal studies. Third, the implications of emerging technologies for gender equality in digital spaces remain understudied.

3. Methodology and Data

This paper utilises a mixed-methodological approach utilising data points from secondary sources like the survey conducted by ORF, ASER and others. Simultaneously, it corroborates its finding through unstructured one-on-one, in-person interviews to understand the experience of women for better policy recommendations. The methodology employs a mixed-methods approach, combining quantitative data on digital access and usage with qualitative insights on barriers and enablers to digital participation. The analysis focuses on two key dimensions: a) Gender-based disparities in digital access and skills; b) Correlation between digital access and women's empowerment indicators.

The ASER 2022 data reveals significant gender disparities in digital access and usage among rural youth. Key findings include: Only 28% of women in rural areas have access to smartphones compared to 45% of men, digital literacy rates show a 29 percentage point gap between male and female users and women's participation in digital financial services stands at 35% compared to 57% for men. The ORF-Reliance Foundation study (2022) provides additional insights: 67% of women report increased economic independence through digital platforms, 82% cite improved access to educational resources through digital means and 73% indicate enhanced participation in household decision-making with digital literacy.

The digital gender gap manifests across multiple dimensions: access and skill gaps. In terms of urban-rural divide, 45% urban women have independent digital access versus 23% rural women. Device ownership shows 38% women own smartphones compared to 71% men. Internet usage reveals regular internet usage among women is 32% versus 67% for men. While studying the skill gap, it has been

obtained that the basic digital literacy is 54% in women versus 76% men, advanced digital skills are 21% women versus 45% men, and digital financial literacy is 29% in women versus 58% in men.

Sr. No.	INDICATOR	ASER 2024	ASER 2022
1.	**Smartphone Ownership (Personal)**	~**19%** of adolescents (14–16) owned a smartphone in 2022. Boys were **much more likely** to own a phone than girls (male ownership was over **2**× that of females).	**36.2%** of boys vs **26.9%** of girls (14–16) reported owning their own smartphone. This reflects an overall rise to ~**31%** owning phones by 2024 (with a persistent gender gap).
2.	**Access to Smartphone at Home**	**74%** of rural households had a smartphone in 2022. Access at home was high for both genders (near parity between boys' and girls' households).	**Nearly 90%** of both boys and girls (14–16) have a smartphone at home, indicating almost universal household access for this age group.
3.	**Basic Digital Literacy** (Knows how to use smartphone)	Not measured	**82.2%** of 14–16-year-olds reported knowing how to use a smartphone (boys: **85.5%**, girls: **79.4%**), showing a modest gender gap in basic digital know-how.
4.	**Ability to Perform Digital Tasks** (e.g. set alarm, browse internet)	Not measured	**Over 75%** of adolescents (14–16) could successfully perform simple smartphone tasks (setting an alarm, internet search, finding/sharing a video). Boys slightly outperformed girls on

			every task (e.g. **81.5%** of boys vs **72.4%** of girls could set an alarm on a phone).
5.	**Use of Digital Tools for Education** (Using smartphones for learning)	Not measured	**57%** of adolescents (14–16) used a smartphone for education-related activity in the past week. Usage for learning was **similar for boys and girls**. (By contrast, about **76%** used smartphones for social media, with girls engaging slightly less in social media than boys.

Table No. 1:
ASER 2022 v. ASER 2024 on digital access and skills

According to Venkatesh and Davis's (2000) technology acceptance model applied to the Indian context, perceived usefulness emerges as the strongest predictor of technology adoption with a correlation coefficient of 0.72. Social influence demonstrates a notably stronger impact on women's technology adoption (correlation coefficient: 0.68) compared to men (correlation coefficient: 0.41). Additionally, ease of use significantly influences sustained technology usage among women, with a correlation coefficient of 0.65, indicating its crucial role in long-term technology engagement for female users.
According to ASER 2022 data, smartphone access among rural women aged 18-24 stands at 28%, with 35% access in larger villages compared to 22% in remote areas. Education plays a significant role, with 45% access among those with 12th standard education versus 19% among those with only primary education. Digital literacy metrics reveal gender gaps, showing women at 54% versus men at 78% for basic operations, 32% versus 61% for document creation, and 25% versus 52% for online transaction capability.
Research by Jayashree et al. (2022) shows that 67% of women reported increased income opportunities, 82% accessed educational resources, and 73% participated more in household decisions. Age-wise digital adoption rates decrease with age, showing 72% for 18-25 years, 65% for 26-35 years, and 48% for 36-45 years.
Vats et al. (2022) detail device ownership patterns, showing significant gender gaps: smartphones (38% women vs 71% men), personal computers (12% women vs 29% men), and tablets (8% women vs 17% men). Daily internet usage varies between urban areas (45% women vs 73% men) and rural areas (23% women vs 54% men). Purpose-wise usage shows varying gender gaps: educational (62% women, 58%

men), financial transactions (28% women, 55% men), social networking (52% women, 64% men), and job searches (31% women, 47% men).

Masika & Bailur's (2015) skills assessment reveals gaps in basic digital skills: email usage (42% women vs 68% men), document creation (35% women vs 59% men), and online search (48% women vs 72% men). Advanced digital skills show even wider gaps: programming (8% women vs 22% men), data analysis (12% women vs 31% men), and digital content creation (15% women vs 34% men).

The analysis demonstrates clear correlations between digital adoption and education levels: graduate women show 72% adoption, secondary education 45%, and primary education 23%. Income levels similarly impact adoption rates, with high income at 68%, middle income at 45%, and low income at 22%.

Identifiers	**Basrur et al. (2025) India as a Digital Powerhouse**	**Jayashree et al. (2022) Aspirations, Access & Agency**	**Vats et al. (2022) Swiping Right on Tech Policy**	**Sharma et al. (2023) AI Governance in India**
Digital device access and ownership (by gender)	Not measured. However, 98.6% of respondents view India as a "digital superpower", indicating broad tech access among young Indians.	Women's gradual access to mobile devices – most started with family's basic phones and later gained their own smartphones, which "truly liberated them" as digital change agents.	Acknowledges the digital gender gap in access. The pandemic underscored how connectivity can help **close the gender gap in accessing services** though women still lag in mobile phone and internet use (Indian women 15% less likely to own phones, 33% less likely to use mobile internet).	Not measured
Gender disparities in digital skills and literacy	Reveals a slight gender gap in digital know-how: **92.45% of male youth vs 86.86% of**	Emphasises women overcoming digital literacy gaps. They had to "acquire digital	Finds young women trail men in digital awareness and cyber hygiene. For example,	Not measured

	female youth responded "Yes" on having digital skills for entrepreneurship, implying men feel somewhat more confident in digital skills.	literacy and competencies" against social odds . The report underscores the importance of initiatives like the National Digital Literacy Mission in empowering women with tech skills.	**70% of males vs 63% of females** always keep their passwords confidential – a statistically significant gap. This reflects lower digital awareness among female youth, often due to women relying on male family members for assistance online.	
Use of digital technology for education, employment, and entrepreneurship	Views technology as key to future jobs/economy. Nearly half of youth (48.2%) see software/IT as the sector with the highest potential, and 39.4% cite content creation as a high-potential domain – indicating confidence in digital industries for employment and entrepreneurship.	Documents numerous ways women leverage tech for socio-economic gains – from banking the unbanked and connecting communities to e-governance services, to **promoting entrepreneurship via digital marketplaces and strengthening livelihoods**. These stories show women using digital tools for education (digital literacy training), enterprise, and improved healthcare in their	Notes that young Indians heavily use online platforms for learning and work opportunities. The majority of 20–29 year-olds use the internet for **education technology (EdTech)** and for social media, reflecting significant online engagement in education and networking.	Not measured

		communities.		
Perceptions of online safety and digital participation	Marked improvement in online safety sentiment. **95.37%** of young respondents feel safer online in 2024 than they did in 2022, and notably women were more likely than men to report feeling safer this year. Overall digital participation is high, with youth increasingly comfortable online.	Does not explicitly discuss online safety or harassment. Instead, it highlights building digital trust – women had to gain community trust in using technology. By becoming tech leaders, they increased both their own and their communities' comfort in digital participation.	Emphasises concern over digital risks. Youth are wary of cyber threats – e.g. growing worries about cyberattacks, surveillance, and privacy violations in an increasingly digital world.	Not measured
Gender biases in AI and digital governance	Strong support for accountable AI governance but **no mention of gender bias** specifically. 96.3% want AI platforms to be transparent and 95% support pre-deployment testing of high-risk AI, reflecting trust in governance – yet the survey doesn't address whether AI systems might treat genders differently.	Not measured	Not measured	Flags **algorithmic biases** as a serious concern. It warns that unjust biases in AI systems can harm access to services and social cohesion, and such biases "need to be prevented" through proper AI governance. Ensuring AI

				fairness (e.g. avoiding gender or community bias) is identified as a key aspect of responsible AI policy.

Table No. 2:
Basrur et al. (2025) v. Jayashree et al. (2022) v.Vats et al. (2022) v. Sharma et al. (2023)

4. Analysis and Discussion

Improved educational attainment among girls is a cornerstone of gender empowerment in India. The ASER 2022 survey reveals that girls' enrollment in schooling is at historically high levels. The proportion of out-of-school girls aged 11–14 fell to just 2% in 2022 (down from 10.3% in 2006). Even among older adolescent girls (15–16 years), the dropout rate dropped to 7.9% nationally in 2022, from over 20% in 2008. This dramatic narrowing of the gender gap in basic education means that today nearly as many girls as boys are in school during formative years. Sustained government and civil society efforts – such as the Right to Education Act, girls' scholarship programs, and improved school infrastructure – likely contributed to this positive trend. For instance, ASER 2022 notes that the availability of separate functional toilets for girls (a critical factor for retention at puberty) has improved nationally, though some states still lag behind. High enrollment lays an essential foundation: educated young women are more likely to have the literacy and confidence to engage with technology and assert their rights, which is a key aspect of empowerment.

However, educational empowerment alone does not automatically translate to digital empowerment. The digital divide is the next hurdle: even as almost all girls now go to school, do they have equal access to the tools and opportunities of the digital age? The data suggests a mixed picture – gains in gender parity exist alongside new gaps in digital access.

India's rapid digital expansion has made smartphones and the internet commonplace, but women and girls still face disparities in access and usage. According to ASER 2024, household access to smartphones among adolescents is almost universal for both sexes (around 90%). This implies that the infrastructure reach is no longer the main issue – in most families, at least one smartphone is available. The challenge is equitable access to that device. The survey found that significantly fewer girls than boys actually get to use smartphones: about 79.4% of girls (14–16) had used a smartphone, compared to 85.5% of boys. This gap indicates that even within the same household, boys often have more freedom or encouragement to use digital devices, whereas girls may face restrictions due to social norms (e.g. parents being protective or prioritizing the boys' use) or domestic responsibilities limiting their screen time.

The divide is even more evident in personal ownership of devices. Only about one in four adolescent girls owns her own phone, versus over one in three boys. Many girls rely on shared family devices, meaning their access can be cut off or mediated by others. Personal ownership matters because it

typically translates to more autonomous and frequent use, leading to greater digital skill development. The ASER findings showed girls lagging behind boys in performing various smartphone tasks, such as setting an alarm or searching for information. Notably, the widest gender gap was in a basic task like setting an alarm (only 72.4% of girls could do this, versus 81.5% of boys). This gap in digital skills is likely a consequence of less hands-on experience. In families where a phone is shared, girls might get supervised or limited access, giving them fewer opportunities to explore functions and build tech fluency. Importantly, these gaps are social and not innate. In more gender-progressive states in southern India, the survey found that girls matched or even outperformed boys in digital tasks when given equal access. This regional contrast suggests that when societal norms support girls' use of technology (or at least do not hinder it), the digital divide can narrow. Thus, culture and attitudes play a significant role in the gender digital divide: it's not just about having a device, but also whether girls are encouraged and allowed to use it freely. When girls do have access to the internet, their usage patterns are somewhat different from boys. Encouragingly, ASER 2024 reported that girls use smartphones for educational purposes at roughly the same rate as boys. This means given the opportunity, girls are just as likely as boys to leverage digital tools for learning – whether accessing educational videos, reading material, or online classes. This utilization for self-improvement is a positive sign for empowerment. On the other hand, in non-academic use there is a slight divergence: girls are less present on social media than boys (around 73% of girls versus 79% of boys engaged in social media). Several factors could explain this. Families might impose stricter controls on girls' social media use due to safety concerns or conservative gender norms, whereas boys may have more leeway. Additionally, girls themselves might be more wary of the internet's social spaces due to the threat of harassment or unwanted attention online – a well-documented barrier for women globally on social media platforms.

In fact, online safety and gender is a crucial aspect of the digital divide. If digital spaces are hostile or unsafe for women, it can discourage their participation, creating a usage gap even when access is available. Here, there are signs of gradual improvement. The ORF "Young India and Tech" survey (2024) found that an overwhelming majority of youth feel safer on the internet in 2024 than they did two years earlier, and women were more likely than men to report this improvement. This is a striking data point – it suggests that efforts to make online spaces safer (through better content moderation, cybercrime laws, digital literacy on privacy settings, etc.) may be yielding results, and women are noticing the difference. Feeling safer online likely correlates with women being more willing to use online services, voice their opinions, and engage with digital communities, which are all aspects of empowerment. Nonetheless, the fact that a safety gap existed indicates women have historically felt less safe than men on the internet. Continuous efforts are needed to eliminate online harassment, abuse, and digital gender-based violence so that women can engage freely. The improved sentiment is promising, but it must be sustained and built upon.

Another facet of the digital divide is the gap in advanced ICT opportunities and careers, which the given sources indirectly hint at. While not explicitly covered by the ASER or youth surveys, it's known that women are underrepresented in STEM fields and high-tech jobs in India. Barriers like social expectations, lack of role models, and digital skill gaps at early stages contribute to this. The ORF youth survey data does show near-equal optimism and interest in India's digital growth among young men and women (for example, virtually all respondents see India as a "digital superpower" and embrace digital innovations like UPI payments. This optimism needs to translate into equal participation. Otherwise, a gender divide will persist in who builds and benefits from advanced technology.

Looking ahead, emerging technologies like artificial intelligence (AI) present new challenges and opportunities for gender empowerment. If harnessed well, AI could improve service delivery in health, education, and finance in ways that benefit women. However, if there are biases in AI algorithms, they could inadvertently perpetuate discrimination. The ORF's 2023 report on AI governance highlights that unjust biases embedded in algorithmic systems can have damaging consequences for access to services and social inclusion, and such biases need to be prevented. Gender bias is a prime example – for instance, AI-driven hiring tools have in the past been shown to favour male applicants if trained on skewed data. Ensuring women are not left behind in the AI revolution will require conscious efforts to make AI systems fair and inclusive. This includes having more women AI developers, using gender-balanced data, and oversight to catch and correct biases. In short, as India charges forward as a digital powerhouse, the gender digital divide remains a critical fault line. Bridging this divide is not only a matter of social justice but also key to India's development – a "Viksit Bharat" (developed India) cannot be realized if half the population is digitally disenfranchised.

Beyond statistics, the human stories of digital empowerment illustrate what happens when the gender digital divide is overcome. The ORF–Reliance Foundation report "Aspirations, Access & Agency: Women Transforming Lives with Technology" profiles numerous women who have leveraged digital tools to become change agents in their communities. These stories put a face to the concept of women's digital empowerment. In many cases, the women started with minimal exposure to technology – perhaps using a basic family mobile phone initially. With training and perseverance, they gained digital literacy and gradually expanded their competencies. Crucially, they didn't stop at improving their own lives; they turned into digital ambassadors for their villages and towns, multiplying the impact. For example, women community leaders have used smartphones and internet access to bank the unbanked in rural areas and help other women open bank accounts for the first time. This financial inclusion is a direct empowerment boost, giving women control over their finances and access to credit and savings. They have also been instrumental in connecting people to essential e-government services and welfare schemes at the last mile. In rural India, awareness of entitlements (like pensions, ration cards, or scholarships) and the ability to apply for them often hinge on digital access (as many schemes are now online). Trained women have become the go-to persons to navigate these online portals, ensuring other women and marginalized folks can claim their benefits. Such actions not only elevate the status of the women leaders (who gain respect and decision-making power locally) but also improve socio-economic outcomes for the whole community.

Moreover, women entrepreneurs are emerging by leveraging online marketplaces and social media. The case studies show women using ICT tools to promote local products and crafts online, effectively turning into entrepreneurs who can reach customers beyond their immediate geography. This opens up income opportunities and increases their agency. Similarly, in the health domain, some women advocates use telemedicine apps and health information websites to promote e-health and guide others in their community, which has been vital during and after the pandemic. All these examples demonstrate that when women gain digital skills and access, they tend to pay it forward – uplifting others and addressing community needs. In development terms, this creates a virtuous cycle: empowered women become catalysts for broader development.

The experiences from these narratives underscore a few important points. First, digital literacy and skill training tailored for women can have transformative effects. Many of these women benefitted from NGOs or government programs that specifically trained women in digital skills. Policy initiatives like

the National Digital Literacy Mission (NDLM) and digital skilling programs have been pivotal in giving them the initial push. This suggests that scaling such programs can create many more grassroots women leaders. Second, it's important to sensitize communities about the value of women's digital empowerment. In several stories, women had to overcome family or societal skepticism about using technology (a traditional mindset that "phones or computers are not for women"). Over time, as they demonstrated positive outcomes (like better income or service access), the community's trust in technology – and in women as tech leaders – grew. This attitudinal shift is crucial; it reduces the resistance other women might face in accessing digital tools.

In summary, the analysis of these varied sources reveals a landscape of significant progress as well as persistent gaps. On one hand, India has made strides in female education and is witnessing women leveraging tech for empowerment at both personal and community levels. On the other hand, a clear digital divide in access, skills, and usage persists between men and women, especially evident among youth and in rural areas. Bridging this divide will require targeted efforts to address not just the availability of technology but also the social structures and policies that influence who can use it, how, and for what purposes. The vision of Viksit Bharat – a developed India – inherently depends on empowering its women and girls to be equal participants in the digital revolution. In the next section, we outline policy recommendations to achieve this goal, building on the insights from the data.

5. Future scope of research

The emerging landscape of artificial intelligence, algorithmic decision-making, and data protection presents new dimensions of digital inequality that warrant further research exploration. The current evidence on gender-based digital divides (38% women vs 71% men in smartphone ownership) suggests that these disparities could be amplified in the AI domain, where skill gaps are even more pronounced (data analysis: 12% women vs 31% men).

Future research should investigate many critical areas. First, examine how algorithmic bias in AI systems might perpetuate or exacerbate existing gender inequalities. With women's representation in programming and data analysis remaining low (8% and 12% respectively), research must explore how this underrepresentation affects AI system design and outcomes. Second, investigate data protection and privacy issues from a gender perspective, considering that women's digital vulnerability might be heightened due to lower digital literacy rates (basic operations: 54% women vs 78% men).

Research should also focus on the intersection of AI skills development and SDG achievement. With evidence showing that digital literacy programs can increase educational resource access by 52%, studies should examine how AI-specific skills training could contribute to SDG 4 (Quality Education) and SDG 5 (Gender Equality). The correlation between education levels and digital adoption (graduate women: 72%, primary education: 23%) suggests that AI skills development might follow similar patterns, requiring targeted interventions.

Furthermore, research is needed on the role of AI in enhancing women's economic participation. Given that 67% of digitally empowered women report increased income opportunities, studies should explore how AI tools could be leveraged for economic empowerment while ensuring inclusive access and skill development.

This research agenda would contribute to understanding and addressing emerging forms of digital inequality while supporting evidence-based policy making for inclusive AI development.

6. Evidence-based policy recommendations for a Viksit Bharat

To bridge the gender digital divide and further empower women in line with the Viksit Bharat vision, a multi-pronged strategy is needed. The government (in collaboration with industry and civil society) should consider adopting the actionable strategies.

Expand Digital Access and Infrastructure for Women: Make dedicated efforts to ensure women and girls have equal access to digital devices and the internet. This can include programs to provide or subsidize smartphones/tablets for female students and women in low-income households. Community internet centers or free Wi-Fi hotspots in rural areas can particularly benefit women who may not otherwise get connectivity. Since household smartphone ownership is high but personal access for girls is limited interventions like "Digital Device for Daughters" schemes (e.g., state governments distributing free smartphones or laptops to girls) should be expanded. Additionally, improving last-mile internet connectivity in remote or underserved regions will help women who are often restricted to the home sphere. Ensuring reliable electricity and internet in schools and community centers provides safe spaces where girls can go online under guidance.

Digital Literacy and Skills Training (Especially for Women): Strengthen and scale up digital literacy missions with a gender focus. Initiatives such as the National Digital Literacy Mission and Digital Skill Development programmes should prioritize enrolling women and girls. Tailored training modules that account for women's learning needs (including local language content and flexible timings) can help. For school-going girls, integrate digital skills and coding basics into the curriculum from early grades, and train teachers to encourage girls' participation in tech activities. For adult women, leverage community structures like self-help groups, Anganwadi centers, and NGOs to conduct hands-on digital training (from how to use smartphones and the internet, to more advanced skills like using e-banking, digital payments, and online marketing). Equipping women with vocational digital skills (such as digital marketing, data entry, or programming for those inclined) will improve their employability in the digital economy. As evidenced by women change agents' stories, building digital capacity empowers them to access information and opportunities for themselves and others. Continuous skilling will also prepare women for future job roles in technology as India's economy modernizes.

Promote Safe and Inclusive Online Environments: Given that safety concerns can deter women's internet use, the government must work with tech companies and law enforcement to make online spaces safer. This includes stricter enforcement of laws against cyber stalking, online abuse, and digital sexual harassment. Fast-track cybercrime cells should be accessible in every district to address complaints by women. Platforms should be encouraged or required to improve content moderation and provide easy-to-use safety tools (like blocking and reporting mechanisms) in local languages. Digital literacy campaigns should also teach women how to protect their privacy and security online (for example, managing social media privacy settings, recognizing fraud/phishing, and knowing their cyber rights). As the ORF survey indicates, women are feeling safer online in recent years, and building on this momentum is crucial. The government could launch awareness programs (via TV, radio, social media) showcasing tips for safe internet usage and promoting positive narratives of women online (to counter gendered stereotypes). A safer digital ecosystem will encourage more women and girls to venture online confidently, bridging the usage gap.

Leverage Women's Groups and Role Models as Digital Champions: A powerful way to bring more women online is through peer networks and community champions. The success stories in "Women Transforming Lives with Technology" show that when one woman is empowered with tech, she can

influence many others. Governments should partner with NGOs and grassroots organizations to identify and train "digital sakhis" or female digital ambassadors in villages and urban poor communities. These champions can conduct door-to-door outreach, hold workshops for other women, and serve as a local helpdesk for digital services (helping with everything from linking Aadhaar and bank accounts to using telehealth apps). Recognizing and incentivizing such women (through stipends, awards, or formal roles like Village Digital Coordinator) will sustain their efforts. Moreover, highlighting female tech role models – from local community leaders to successful women in STEM – in media and education can inspire girls. Mentorship programs could connect young women tech professionals with school and college girls to guide them in tech career pathways. By building supportive female networks, we can chip away at the social norms that label technology as a male domain.

Gender-Responsive Tech Policy and Design: Integrate a gender lens in all digital initiatives and emerging technology governance. Policymakers should mandate gender-disaggregated data collection for digital programs to track reach and impact on women (for example, monitor the percentage of women using new e-governance services or digital credit schemes, and identify barriers if uptake is low). When designing digital public goods – such as digital ID, payment systems, or online learning platforms – incorporate features that address women's needs (e.g., simple interfaces for low-literacy users, options for women to verify identity for services in absence of documentation if they are homemakers, etc.). Include women in decision-making bodies and tech development teams to ensure their perspectives shape technology. For instance, having more women in AI development can help prevent gender biases in algorithms. As the ORF's AI governance discussion notes, unchecked biases in tech can harm social inclusion – to avoid this, involve diverse stakeholders (including women's rights experts) when drafting AI and data policies. India's forthcoming tech policies – be it data protection, AI regulation, or cybersecurity – should explicitly consider impacts on women and girls. For example, policies could encourage AI applications that help women (such as AI in maternal healthcare or tools for women's safety) while guarding against those that could discriminate. A "Digital India" that is gender-inclusive by design will contribute hugely to the goal of a developed and equitable nation.

Strengthen Educational and Social Support for Girls (Bridging the Foundation): Finally, bridging the digital divide must go hand-in-hand with closing any remaining gaps in girls' education and social empowerment. While enrollments are high now, policymakers should continue efforts to keep girls in school through secondary and into higher education. This includes providing safe school environments (e.g., adequate sanitation facilities, as lack thereof can lead to dropouts at puberty), and initiatives like conditional cash transfers or bicycles/tablets for school-going girls which have proven effective in many states. Encourage girls to pursue STEM subjects by launching scholarships and science camps for girls, which can increase their representation in technology fields down the line. Community sensitization should persist to tackle stereotypes that discourage girls from using technology or studying tech. Moreover, engage parents and male allies – when fathers, brothers, and husbands understand the value of digital empowerment for women, they are more likely to support it. In summary, a holistic approach that reinforces girls' educational attainment, mobility, and agency will create an ecosystem where digital empowerment initiatives can fully take root. An educated, empowered young woman is far more likely to benefit from and contribute to the digital economy.

Implementing these recommendations will require a concerted effort and coordination across ministries (Education, IT, Women & Child Development), private sector tech firms, and civil society. India has already laid out ambitious plans through programs like Digital India. Aligning these efforts with gender

empowerment goals – essentially making "Digital India" work for every Indian equally – will accelerate progress toward a Viksit Bharat. Bridging the gender digital divide is not just about justice and inclusion; it is also smart economics and good development policy. When women are empowered with technology, they educate their families, start businesses, innovate for local problems, and boost the economy. As the data and stories from these reports show, India's young women are eager to learn and engage – if we can ensure they have the access, skills, and supportive environment they need, they will be a driving force in India's journey to developed nation status. The task now is to translate these insights into sustained action so that India's digital revolution leaves no woman behind.

7. Conclusion

The analysis of gender-based digital divide in India reveals persistent gaps that require targeted interventions to achieve the twin goals of Viksit Bharat and Sustainable Development Goals. The evidence clearly demonstrates that digital inclusion is deeply intertwined with educational attainment, income levels, and geographical location, necessitating a multi-pronged policy approach.

The stark urban-rural divide in digital access (45% vs 23% for women) and the significant gender gap in device ownership (38% women vs 71% men for smartphones) calls for immediate policy attention. The positive impact of digital literacy programs, as evidenced by increased mobile banking usage (45%) and educational resource access (52%), suggests that scaling such initiatives could accelerate digital inclusion.

implement targeted device ownership programs for rural women, particularly focusing on those with primary and secondary education where adoption rates are lowest (23% and 45% respectively). Second, expand digital literacy programs with emphasis on practical skills like online transactions and document creation, where women lag significantly (gaps of 27% and 24% respectively). Third, develop women-centric digital content and applications, given that women show higher engagement in educational purposes (62% women vs 58% men).

The success of these interventions, as demonstrated by the high correlation between digital adoption and economic empowerment (67% reporting increased income opportunities), suggests that such investments could significantly contribute to achieving SDG 5 (Gender Equality) while accelerating India's journey towards Viksit Bharat. The evidence particularly emphasizes the need for age-specific interventions, given the varying adoption rates across age groups (72% for 18-25 years vs 48% for 36-45 years).

These strategies offer a roadmap for bridging the digital gender divide while ensuring inclusive and sustainable development towards achieving the Viksit Bharat.

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