The gender gap in stem entrepreneurship: women, challenges and interventions

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Abstract

This paper examines the persistent gender gap in STEM entrepreneurship in India, focusing on the structural and cultural barriers that hinder women from fully participating in innovation-driven enterprises. Using a combination of secondary data analysis from national entrepreneurship reports, policy frameworks, empirical data and qualitative case studies of women-led STEM startups, this study highlights successful interventions, including government initiatives, corporate incubators, and educational reforms that promote women-led innovation and identifies key challenges such as societal biases, limited access to funding, and insufficient policy support. The research is placed within the framework of the Viksit Bharat 2047 strategic blueprint, which recognizes gender inclusion as essential to holistic national development. The paper argues that targeted interventions and policies to empower women entrepreneurs in STEM will not only reduce the gender gap but also drive innovation and economic growth, contributing significantly to India's vision of becoming a developed nation by 2047. It proposes actionable strategies to promote inclusive STEM entrepreneurship. The paper aligns its findings with the theme, arguing that empowering women in STEM is crucial to achieving a self-reliant, innovation-driven, and equitable economy. Recommendations include gender-responsive venture capital policies, STEM education incentives for girls, and public-private partnerships to bridge the gap, ensuring women contribute equitably to India's technological and entrepreneurial future.

Keywords: Gender Gap in STEM, Women Entrepreneurship, Viksit Bharat 2047, India

1. Introduction

The Global Gender Gap Index annually benchmarks the current state and evolution of gender parity across four key dimensions (subindexes): Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment. It is the longest-standing index tracking the progress of numerous countries' efforts towards closing these gaps over time. This year, the Global Gender Gap Index benchmarks gender parity across 148 economies, providing a basis for the analysis of gender parity developments across two-thirds of the world's economies. India ranks 131 out of 148 countries, with particularly low scores in economic participation and opportunity subindex - the pillar essential for meaningful gender parity. Women continue to earn less than a third of what men do and female labour force participation remains stubbornly low. These are not just social indicators. They are signs of a structural failure holding back national progress. India is now a global economic power, a digital innovator, and home to the world's largest youth population. But the World Economic Forum's Global Gender Gap Report (2025) is a sobering reminder that when it comes to gender equality, India remains far behind.

As per the Ministry of Statistics and Programme Implementation's Periodic Labour Force Survey 2023–24, India's female labour force participation rate (FLFPR) has climbed to 41.7%, marking a significant rise after a prolonged phase of stagnation. This surge is more pronounced among rural women (47.6%) compared to urban women (25.4%), revealing persistent barriers such as limited access to formal jobs, inadequate workplace safety, and entrenched social norms. The disparity is even starker in STEM fields. As reported by the UNESCO Institute for Statistics in 2021, women make up only 31.5% of researchers globally. This gap between education and employment highlights systemic hurdles that industries are uniquely positioned to address.

The economic implications are substantial. According to McKinsey Global Institute, integrating an additional 68 million women into India's workforce could potentially increase the nation's GDP by up to $700 billion by 2025. Similarly, World Bank projections indicate that achieving a 50% female participation rate could boost GDP growth by 1%. Conversely, if women continue to be excluded or drop out of the workforce, the dependency ratio will climb more rapidly, burdening a shrinking labour base and threatening fiscal sustainability. Reversing this trajectory requires cohesive strategies that bridge health, labour, and social protection policies.

Central to this vision is the empowerment of women and the promotion of gender inclusion across all sectors, particularly in STEM fields. Despite progress in education and workforce participation, women entrepreneurs in STEM continue to face significant barriers that limit their potential and economic contribution.

2. Women LED enterprises: case studies and success stories

Despite these challenges, there are examples of successful women-led startups in technology and innovation, which highlight the potential for broader societal and economic impact. The analysis also points to a growing ecosystem of mentorship programs, incubators, and policy initiatives that are beginning to address these gaps.

Several Indian women have broken the glass ceiling in STEM entrepreneurship. Entrepreneurs like Ruchi Kalra (Oxyzo), Aditi Avasthi (Embibe), and Dr. Aditi Sen De (Quantum Physicist) offer inspiration and demonstrate the potential of women-led innovation in STEM fields. Their journeys highlight the importance of strong educational foundations, global exposure, access to networks, and strategic mentorship.

Another notable initiative is She Leads Tech by Facebook India, which has supported over 500 women-led startups in tech. Similarly, WE-Hub in Telangana, India's first state-led incubator for women entrepreneurs, focuses specifically on tech-based businesses. These programs show that when supportive ecosystems are created, women can lead innovation and build impactful, scalable enterprises.

Dr. Aditi Gupta, Founder of a HealthTech Startup. She is a PhD in biotechnology, identified a gap in affordable diagnostic solutions for rural healthcare. Despite her strong academic background, she faced hurdles in acquiring seed funding due to investor bias towards male-led startups. She eventually secured funding through a women-focused accelerator program and leveraged mentorship to navigate the business landscape. Her startup developed a low-cost diagnostic device that quickly gained traction in underserved areas. Dr. Gupta's journey underscores both the barriers and the value of targeted intervention.

Nevertheless, such stories remain exceptions rather than the rule. The challenge lies in replicating such support structures at scale, particularly in underserved regions and emerging STEM sectors. India's demographic dividend cannot be fully leveraged unless such isolated successes become normalized pathways for thousands of aspiring women innovators.

3. Challenges

Among the various sectors that will play a pivotal role in achieving this vision, STEM (Science, Technology, Engineering, and Mathematics) entrepreneurship occupies a central position. However, the underrepresentation of women in STEM entrepreneurship presents a significant barrier to achieving inclusive growth. Women's participation in entrepreneurship in India has been steadily growing, but significant disparities remain, especially in STEM-driven sectors. While India produces a large number of women STEM graduates i.e., 43%, but only a small fraction transition into entrepreneurship. The current share of women in India's STEM workforce is around 27%, below the global average, and their presence in leadership roles or as founders is even lower. Multiple studies reveal that women-led startups in STEM domains form less than 10% of the total, highlighting a sharp attrition between education and entrepreneurial practice.

Key structural challenges include access to capital. Women entrepreneurs often struggle more than their male counterparts to secure funding, due to both unconscious bias and lack of access to networks. Additionally, societal expectations regarding family responsibilities often limit women's ability to scale their ventures. Moreover, STEM entrepreneurship often demands high-risk tolerance, technological autonomy, and prolonged engagement with predominantly male-dominated spaces, making it less accessible or welcoming for women, especially in Tier 2 and Tier 3 cities. The burden of unpaid domestic responsibilities and caregiving roles also restricts women's ability to fully engage in entrepreneurial activities, particularly in high-intensity, high-growth sectors.

Even though more women in India are gaining access to education, their health and autonomy still lag behind. This reflects a long-standing neglect of women's reproductive health, preventive care, and nutrition, problems that weigh heaviest on those from rural and low-income communities. When women are not healthy, real economic participation simply isn't possible. Alarming evidence comes from the National Family Health Survey (NFHS-5), which shows that nearly 57% of women aged 15 to 49 are anaemic. This not only affects their ability to study and work but also makes pregnancy riskier. This isn't just a health statistic - it's a mirror of a much larger failure to place women's health at the heart of national development. Addressing this requires more than token programs. It calls for meaningful investments in primary health care, better nutrition, and accessible services that allow women to live healthier, more empowered lives. Boosting health budgets, especially at the local level, is a critical first step toward ensuring women can claim their rightful place in education, work, and society.

4. Policy and existing interventions

To bridge the gender gap meaningfully in STEM entrepreneurship, a combination of targeted interventions and policy reforms is essential. Financial inclusion programs that prioritize women-led ventures can help close the funding gap. Government and private sector partnerships can create more women-focused incubators and accelerators, providing not just capital but also mentorship and network access.

The Government of India has recognized the importance of gender-inclusive entrepreneurship and has introduced several schemes to address the issue. Initiatives like Startup India, Stand-Up India, TREAD (Trade Related Entrepreneurship Assistance and Development), and the Women Entrepreneurship Platform by NITI Aayog are notable efforts. These schemes offer credit, mentorship, incubation support, and market access specifically to women entrepreneurs.

However, these interventions often fail to address the unique challenges faced by women in STEM domains. While general support structures for entrepreneurship exist, there is a lack of targeted initiatives that foster women's leadership in high-tech sectors like AI, biotechnology, clean energy, aerospace, and deep-tech startups. Moreover, most schemes are urban-centric and have limited penetration in rural and semi-urban regions.

Policy reforms aimed at encouraging women in STEM fields should also address the dual responsibility many women face. Flexible work policies and support systems for women entrepreneurs can make a significant difference. Finally, changing societal narratives around women in technology and leadership through media and community engagement is crucial for long-term change.

There is a need for more granular, sector-specific policies that recognize the intersectionality of gender with geography, class, and educational access. Inclusion in STEM entrepreneurship cannot be achieved by economic policy alone, it must also be a function of educational reform, cultural change, and institutional accountability.

5. Suggestions and Conclusion

India can draw from successful international models that have narrowed the gender gap in STEM entrepreneurship. Countries like Canada, Sweden, and Israel have developed ecosystem-wide frameworks that include: STEM entrepreneurship grants specifically for women, Mandatory gender impact assessments in funding and innovation policies, Inclusive design of incubation spaces and networking platforms, STEM mentorship programs in high schools and universities with female mentors, Tax incentives for companies that invest in women-led STEM enterprises.

To ensure women are central to the STEM entrepreneurship landscape of a developed India by 2047, a multi-tiered strategy is required. The roadmap proposed is as follows: Educational Reforms, Policy Interventions, Access to Capital and Infrastructure, Mentorship and Networking, Inclusion in Digital India Vision, Decentralization of Incubators, Monitoring and Evaluation.

Adapting these frameworks to the Indian context, with a focus on local cultural sensibilities and infrastructural realities, can accelerate progress. For example, a STEM-focussed rural entrepreneurship model can integrate digital labs, AI-enabled agricultural solutions, and clean energy startups led by women with support from local institutions.

India does not lack frameworks or ambition; the slogans are there. What is required is real investment: in public health systems that prioritise women's needs; in care services that redistribute unpaid work, and in policies that see women not as beneficiaries, but as builders of the economy. India must treat gender equality as central to its economic and demographic future. At the current pace of progress, it may take over a century to close the global economic gender gap and India lags behind even that trajectory.

As India charts its course toward *Viksit Bharat 2047*, the role of women in STEM entrepreneurship must transition from the margins to the mainstream. Bridging the gender gap in this critical area is not only a matter of social justice but a strategic imperative for innovation-led, inclusive development. A gender-balanced entrepreneurial ecosystem in STEM will contribute to job creation, technological advancement, and national self-reliance.

India stands at a crucial demographic crossroads. Even as it continues to benefit from a youthful population, the share of senior citizens is set to almost double by 2050, accounting for around 20% of the total population. A significant portion of this group will be elderly women, many of them widows, who are more likely to face financial and social dependency. At the same time, the working-age population will contract, while the demand for elder care will grow sharply. In this scenario, sustained economic growth will be impossible without ensuring that women - who make up half the population; are healthy, empowered, and fully engaged in the workforce. Gender equality can no longer be viewed solely as a matter of justice; it has become an economic and demographic imperative. The World Economic Forum's Global Gender Gap Report serves not merely as a global ranking but as a clear warning: if India does not place gender equality at the centre of its development strategy, it risks undermining the very progress it has worked so hard to build.

This paper argues that a comprehensive and intersectional approach - combining educational reform, economic incentives, mentorship, and structural transformation is vital. India's success as a developed nation by 2047 will, in no small measure, depend on how effectively it empowers its women to lead in science, technology, and enterprise.

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