

## Bridging The Gender Gap: Transforming Engineering Hiring Practices for Equity

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### ABSTRACT

Engineering remains one of the most gender-imbalanced professions globally, with women continuing to face systemic discrimination that limits their participation and advancement. Despite increasing female enrollment in engineering education, biases in hiring practices persist, from discouraging women from applying to subjecting them to discriminatory questioning during interviews. This paper examines the historical roots of gender discrimination in engineering and presents data illustrating the continued underrepresentation of women in traditionally male-dominated branches. It explores the psychological impacts of biased hiring practices on women engineers, including stereotype threat, imposter syndrome, and chronic stress, which undermine their confidence and long-term career prospects. Drawing on empirical evidence, the paper offers actionable recommendations to foster equitable and inclusive hiring, such as implementing gender-sensitive recruitment processes, providing bias awareness training, and creating supportive organizational cultures. Addressing these persistent barriers is essential not only for achieving gender equity but also for unlocking the full innovative potential of the engineering sector.

**Keywords:** *Gender Discrimination, Engineering, Women in Stem, Hiring Bias, Inclusion, Stereotype Threat, Psychological Impacts, Equity in Engineering*

Engineering remains one of the most gender-imbalanced professions globally, with systemic biases in hiring practices continuing to restrict women's participation and advancement. According to UNESCO's *Cracking the Code: Girls' and Women's Education in STEM* (2017), while women account for 28% of engineering graduates worldwide, their representation declines sharply in the workforce, particularly in traditionally male-dominated fields such as mechanical, civil, and aerospace engineering. Data from the 2023 All India Survey on Higher Education (AISHE) further illustrates this disparity: women make up 43% of overall STEM enrolments in India, yet only around 10% of students in mechanical engineering, highlighting enduring gender gaps.

Despite increased awareness of gender equality, many companies still prefer male candidates during recruitment, with some even avoiding interviews with qualified women. In cases where women are interviewed, they often face discriminatory questioning, stereotypes, or outright rejection unrelated to their abilities. A report by the American

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Association of University Women (AAUW, 2015) found that nearly half of women in engineering experience bias or exclusion in hiring or early career stages, underscoring the systemic nature of this issue.

This reality reflects patterns established decades ago, as exemplified by Sudha Murty's experience. As a young engineer, Murty applied for a position at TELCO (now Tata Motors) but encountered an explicit sign reading "Ladies need not apply." Her determination eventually led to her being hired as the first female engineer at the company, yet her story starkly reveals how overt gender discrimination shaped the culture of the engineering profession. Despite advances in policy and advocacy, many of these biases remain embedded in recruitment and workplace practices today.

This paper argues that addressing enduring biases in engineering hiring is essential for creating equitable workplaces, supporting women's psychological well-being, and unlocking the full potential of innovation within the engineering sector.

### ***Historical Context***

Engineering has historically exhibited entrenched gender biases, with social norms casting technical fields as a male domain. Throughout the 20th century, women were excluded from engineering education and careers both formally through institutional policies and informally through cultural stereotypes. Fields such as mechanical and civil engineering were perceived as requiring qualities stereotypically associated with men, including physical strength and decisiveness, while women were viewed as better suited for nurturing or administrative roles. These beliefs erected barriers long before women even had the chance to pursue engineering degrees.

A striking example of these barriers is seen in the experience of Sudha Murty, a pioneering engineer, author, and philanthropist. In the 1970s, as a gold medalist in engineering, Murty applied for a position at TELCO but encountered a notice reading "Ladies need not apply." This blatant discrimination reflected the prevailing mindset of the time, with companies openly excluding women from technical roles. Demonstrating remarkable determination, Murty wrote directly to J.R.D. Tata to challenge this policy, ultimately securing an interview and becoming TELCO's first female engineer. While her success broke a significant barrier, her story highlights the widespread and normalized gender discrimination that once defined engineering workplaces.

This pattern was not unique to India; in the United States, data from the National Science Foundation (NSF) highlights the severity of the gender gap. In 1970, women earned just 0.8% of engineering bachelor's degrees, rising only to 5.8% by 1980, and reaching approximately 20% by 2000 (NSF, Science and Engineering Indicators, 2020). These figures demonstrate how engineering was overwhelmingly male-dominated for much of modern history, with change occurring slowly despite growing awareness of gender disparities.

In India, a similar trend emerged. According to AISHE, women's enrollment in engineering and technology programs during the early 1990s was below 10%, underscoring the severe underrepresentation of women in technical education at the time (AISHE, 2019). Although female participation in STEM fields overall has improved significantly, reaching 43% of total STEM enrollments in India today, certain branches remain starkly male-dominated. Recent AISHE data show women account for only 10% of enrollments in mechanical

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engineering and 12% in civil engineering (AISHE, 2023), highlighting persistent gaps even amid broader progress.

These historical patterns created a self-perpetuating cycle. The absence of women in engineering roles reinforced perceptions of engineering as a male profession, discouraging more women from entering the field. Social role theory explains how cultural norms shape expectations and internalized beliefs, leading both men and women to view engineering as unsuitable for women. Furthermore, organizational cultures evolved around male-centric networks and informal practices that often excluded or marginalized the few women who entered engineering, limiting their opportunities to thrive.

Although explicit barriers such as “ladies need not apply” signs have disappeared, the legacy of this discrimination persists in the form of subtle biases. Assumptions that women engineers are less committed, more likely to prioritize family over work, or better suited for support roles instead of leadership remain ingrained in some hiring and promotion processes. Recognizing and addressing this history is crucial for creating meaningful, structural changes that enable equitable and inclusive engineering workplaces.

Understanding these historical patterns provides essential context for examining the hiring practices that continue to disadvantage women today.

### ***Current Hiring Practices***

Despite strides in increasing women’s enrollment in engineering education, gender biases persist in hiring processes across the engineering sector. These biases appear in two main forms: avoidance of female candidates during recruitment, and discriminatory interview practices that disadvantage women, particularly in traditionally male-dominated branches.

- **Avoidance of Female Candidates**

Recent data highlight how many companies still subtly discourage applications from women, especially for positions in mechanical, civil, or heavy engineering. A 2022 report by the World Bank and UNESCO (Closing Gender Gaps in STEM) found that over 30% of women engineers in South Asia reported being explicitly or implicitly discouraged from pursuing technical roles during recruitment. This discouragement often appears through recruiters emphasizing physical demands, frequent travel, or field postings, reinforcing stereotypes that women are unsuitable for core engineering roles. In India, a study by the National Task Force on Women in Science and Technology (DST, 2021) revealed that 27% of female engineering graduates reported never being shortlisted for interviews in core engineering sectors, despite having qualifications equal to or better than those of their male peers. These patterns echo historical exclusions and demonstrate how outdated biases continue to shape recruitment decisions today.

- **Discriminatory Interview Practices**

Even when women secure interviews, they frequently face discriminatory questioning that reflects lingering stereotypes. Many report being asked about marital status, plans for children, or willingness to work late or travel—questions rarely posed to men. A 2018 survey by the Confederation of Indian Industry (CII) and Catalyst India found that 42% of women engineers were asked personal or family-related questions during interviews, compared with only 8% of men, revealing a stark gender disparity in interview experiences. These issues are not unique to India. In the U.S., McKinsey’s 2021 Women in the Workplace report found that women in STEM were 1.5 times more likely than men to report

feeling judged by different standards during recruitment, with hiring managers questioning their long-term commitment or cultural fit within male-dominated teams.

- **Persistent Gender Gaps in Hiring Outcomes**

Although women's overall participation in STEM has increased, hiring data show that certain engineering branches remain overwhelmingly male. According to AISHE 2023, women make up only 10% of enrollments in mechanical engineering and 12% in civil engineering, compared with about 40% in branches like computer science or electronics. These disparities are mirrored in placement statistics from leading technical institutes, which show core engineering firms offering jobs to men at nearly twice the rate of equally qualified women, especially in heavy industry, automotive, and infrastructure sectors.

- **Organizational Culture and Referral Bias**

Beyond formal recruitment processes, organizational culture plays a significant role in perpetuating bias. Many engineering firms rely heavily on informal, male-dominated referral networks. A 2020 Harvard Business Review study found that over 60% of engineering hires occur through referrals, often from existing male employees, effectively sidelining women before the interview process even begins. Selection committees and hiring panels in many companies remain predominantly male, increasing the likelihood of unconscious bias in evaluations. Without diverse perspectives, women candidates face subtle but significant disadvantages.

- **Gaps between Policy and Practice**

While many organizations have formal diversity policies, these often lack meaningful implementation. A 2021 Deloitte India study found that although 54% of engineering firms reported having diversity policies, only 18% had adopted structured, gender-sensitive hiring practices, such as standardized interviews, blind resume screening, or bias awareness training. This disconnect between policy and practice undermines efforts to build inclusive workplaces and perpetuates systemic inequality.

Understanding these challenges reveals how gender bias in hiring continues to impact women engineers, not only in gaining entry to the profession but also in shaping their experiences from the very beginning of their careers.

## **PSYCHOLOGICAL IMPACTS OF GENDER BIAS IN ENGINEERING HIRING**

Gender bias during hiring and early career stages has profound psychological consequences for women engineers, affecting their confidence, well-being, and long-term professional trajectories. Repeated exposure to biased treatment not only limits opportunities but also undermines women's sense of belonging and motivation to persist in engineering.

- **Stereotype Threat and Performance**

Stereotype threat arises when individuals fear confirming negative stereotypes about their social group, causing anxiety and impaired performance. Spencer et al. (1999) demonstrated that women reminded of stereotypes about gender and technical ability performed significantly worse on engineering-related tasks. During interviews, awareness of such stereotypes can increase stress and self-doubt, reducing performance and the likelihood of success regardless of competence.

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- **Imposter Syndrome and Self-Doubt**

Discriminatory hiring experiences often trigger or intensify imposter syndrome, in which individuals feel undeserving of their achievements despite evidence of capability. A 2018 survey by the Society of Women Engineers found that 58% of women engineers reported experiencing imposter syndrome in the first five years of their careers, often stemming from cues during interviews and early employment suggesting they did not belong.

- **Psychological Stress and Mental Health**

Bias during recruitment can cause prolonged stress. A 2019 survey by the Center for Talent Innovation found that 66% of women engineers in India experienced persistent stress related to feeling undervalued or unwelcome during hiring and onboarding. This stress was associated with higher rates of anxiety, disengagement, and burnout compared to men. This chronic stress can create a vicious cycle: women who feel excluded early in their careers are more likely to disengage or leave the profession, reinforcing engineering's male-dominated image and perpetuating underrepresentation.

- **Social Identity and Sense of Belonging**

Social identity theory (Tajfel & Turner, 1979) suggests individuals derive part of their self-esteem from a sense of belonging. Women who enter male-dominated engineering environments after facing biased hiring processes often struggle to feel accepted, undermining engagement and satisfaction. McKinsey's 2021 report found that women who identified as "onlys" being the only woman on a team were twice as likely to consider leaving their jobs within two years, highlighting how isolation fuels attrition.

- **Impact on Career Progression**

Bias at the hiring stage has lasting effects beyond recruitment. Women who start their careers feeling undervalued or marginalized are less likely to pursue promotions or leadership opportunities. The AAUW's 2015 report found that women engineers who experienced hiring bias were 2.5 times more likely to report stalled career progression than those who began their careers in inclusive environments.

These psychological impacts demonstrate how biased hiring is not merely a barrier to entry but a significant factor shaping women's long-term success and retention in engineering.

### **RECOMMENDATIONS**

Addressing gender discrimination in engineering hiring requires moving beyond symbolic diversity statements to concrete, systemic actions across education, recruitment, and workplace practices. Based on the analysis and data presented, the following strategies can help build equitable and inclusive environments in engineering:

#### **Implement Gender-Sensitive Hiring Practices**

- Use structured, standardized interviews to reduce subjective judgments.
- Adopt blind resume screening to focus on qualifications without gender bias.
- Ensure interview panels include diverse members, especially women engineers and leaders, to encourage balanced decision-making.

#### **Provide Bias Awareness Training**

- Make training on recognizing and addressing implicit bias mandatory for hiring managers and recruiters.

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- Incorporate practical modules on equitable interviewing techniques and inclusive communication.

### **Establish Transparent Recruitment Processes**

- Clearly define and communicate objective selection criteria for all candidates.
- Regularly audit recruitment data to identify disparities in shortlisting, interviews, and offers extended to women compared to men.

### **Expand Outreach to Female Engineering Students**

- Collaborate with technical institutions to actively recruit qualified women, particularly in male-dominated branches like mechanical and civil engineering.
- Offer targeted scholarships, internships, and early-career programs to attract and support women entering core engineering sectors.

### **Promote Inclusive Workplace Cultures**

- Develop mentorship and sponsorship programs connecting junior women engineers with experienced allies who can provide guidance and advocacy.
- Recognize and celebrate the achievements of women engineers to create visible role models.
- Implement flexible work policies that support work-life balance for all employees, reducing stereotypes about women's commitment.

### **Monitor and Report Progress**

- Collect, analyze, and publish gender-disaggregated data on hiring, promotions, and retention.
- Set measurable diversity and inclusion goals, and hold leadership accountable for achieving them.

### **Strengthen Collaboration between Industry and Academia**

- Partner with academic institutions and professional organizations to develop initiatives challenging stereotypes and encouraging girls to pursue engineering careers from an early age.

Implementing these recommendations can help dismantle systemic barriers, foster inclusive cultures, and ensure engineering workplaces recognize and nurture talent without gender bias.

## **CONCLUSION**

Engineering continues to bear the lasting impacts of historical and systemic gender discrimination, which remain evident in hiring practices and organizational cultures today. Although overt barriers like “ladies need not apply” signs are no longer present, recent data clearly show that women still face significant disadvantages during recruitment, ranging from discouragement and discriminatory questioning to exclusion from informal, male-dominated networks. These practices limit women's professional opportunities and have serious psychological consequences, including increased stress, imposter syndrome, and a weakened sense of belonging.

Addressing these challenges is critical not only for achieving fairness and gender equity but also for unlocking the innovative potential that comes with diverse perspectives in engineering. By adopting structured, bias-reducing hiring practices, fostering inclusive

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workplace cultures, and committing to transparent, data-driven progress, organizations can break down systemic barriers and create environments where women engineers can thrive. Building an engineering profession that evaluates every candidate fairly and supports them throughout their careers benefits individuals, strengthens organizations, and drives progress for society as a whole. Through deliberate, evidence-based efforts, the engineering community can create a future where opportunities are defined by talent and dedication, not by gender, and where excellence and innovation are truly inclusive.

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***Conflict of Interest***

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