

WOMEN IN IT: IDENTIFYING OBSTACLES AND ENABLERS FOR A MORE INCLUSIVE INDUSTRY

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ABSTRACT

The information technology (IT) sector has been a driving force behind economic growth, innovation, and digital transformation. However, gender disparity remains a significant issue, with women constituting only 26% of computing and technology roles despite making up nearly half of the overall U.S. workforce. This research examines the historical trends of gender representation in IT, the systemic challenges faced by women in the sector, and the broader implications of gender diversity in technology-driven innovation.

Through a mixed-methods approach, the study utilizes structured surveys and in-depth interviews with women IT professionals to identify key barriers such as gender bias, workplace culture, career progression limitations, and work-life balance challenges. Sentiment analysis and NVivo-generated word clouds provide insights into the prevailing workplace experiences of women in IT, highlighting recurring themes of stagnation, maternal bias, lack of leadership opportunities, and the need to work twice as hard to achieve recognition.

The findings indicate that while some organizations are making efforts to foster inclusivity, significant gaps persist in leadership representation, pay equity, and professional development opportunities. Respondents emphasize the need for targeted initiatives, including mentorship programs, equitable hiring practices, and flexible work policies, to create a more supportive environment for women in IT. Addressing these challenges require collaborative efforts from industry leaders, policymakers, and educational institutions to bridge the gender gap and promote a more diverse and innovative IT workforce.

This study contributes to ongoing discussions on gender equity in the technology sector and provides actionable recommendations for organizations seeking to create a more inclusive and supportive environment for women in IT.

Keywords: Women, IT, Challenges in IT, Bias, Gender Disparity

INTRODUCTION

The information technology (IT) sector has long been recognized as a driver of economic growth, innovation, and digital transformation across industries. While it's acknowledged that diversity drives business innovation and creates a strong cultural foundation, the tech industry and higher education institutions fall short when it comes to supporting and channeling more women into tech fields. In 2022, women represented 49% of the total employed adults in the US, but a mere 26% of roles in computing and technology, according to a State of the Tech report released by the Computing Technology Industry Association (CompTIA), with significantly less representation by Black and Hispanic women. Despite efforts to address this gender gap, the ratio of women in technology positions has declined over the past 35 years. (Sarah White, 2024)

Meanwhile, the stereotype of the male “computer geek” seems to be everywhere in popular culture. (Janet Abate, 2017). Despite its expansion and increasing influence, the IT workforce in the United States remains largely male-dominated. Women continue to be underrepresented in IT-related roles, facing systemic barriers that limit their participation and advancement. The challenges faced by women working in IT are multifaceted, encompassing issues such as gender bias, workplace culture, unequal opportunities for career growth, and the persistent gender pay gap. These barriers not only hinder individual career progress but also contribute to a lack of diversity in the IT workforce, which has been shown to negatively impact innovation and problem-solving within the industry.

Historical Trends of Gender Representation in IT

The gender gap in IT is not a new phenomenon. Historically, women played a crucial role in the early development of computing, with pioneers such as Ada Lovelace and Grace Hopper making significant contributions to the field. During the mid-20th century, women were actively involved in programming, particularly in roles that involved coding and computing for military and government projects. However, by the 1980s, as personal computing became more mainstream and was marketed primarily toward men, the gender disparity in IT widened (Abbate, 2012).

The decline of women in IT-related fields can be traced to cultural and educational shifts that reinforced gender stereotypes. In the 1970s and 1980s, the increasing association of computing with “geek” and “hacker” subcultures—predominantly male-dominated communities—

discouraged women from pursuing careers in IT. Educational institutions and industry hiring practices also contributed to this shift, with fewer women enrolling in computer science programs and, consequently, entering the IT workforce (Varma, 2010). By the 1990s and early 2000s, efforts to encourage gender diversity in STEM fields had gained momentum, but significant gaps remained in hiring, retention, and leadership representation.

The Role of Women in the IT Sector

Despite systemic challenges, women in IT have made significant contributions to technological innovation, leadership, and entrepreneurship. Women occupy various roles in IT, including software development, cybersecurity, data analysis, IT project management, and executive leadership. However, while progress has been made, disparities persist at every career stage. According to the National Center for Women & Information Technology (NCWIT), women account for approximately 26% of computing-related occupations, with even lower representation in senior leadership and technical roles (NCWIT, 2023). With evidence suggesting that biological sex differences in inherent aptitude for math and science are small or non-existent. DF Halpern, CP Benbow, DC Geary, RC Gur, JS Hyde, MA Gernsbacher, (2007). The efforts of many researchers and academic leaders to identify causes of the science gender disparity have focused instead on the life choices that may compete with women's pursuit of the most demanding positions. SJ Ceci, (2011).

Research indicates that women are more likely to experience exclusion from technical decision-making, lack mentorship opportunities, and face skepticism about their technical abilities from colleagues. (Williams, 2015). Moreover, the "leaky pipeline" phenomenon—the tendency for women to leave IT careers at higher rates than men—further exacerbates gender disparity, roughly half of women drop out of IT by age 35. (Sarah White, 2024). There are many factors that contribute to satisfaction on the quality of IT services (Simon, L, 2017)

Key Challenges Faced by Women in IT

The challenges faced by women in IT are rooted in a combination of societal norms, workplace dynamics, and industry-specific barriers. Some of the most significant challenges include:

1. Gender Bias and Stereotypes

Women in IT often contend with implicit and explicit biases that question their technical competence. Research has found that women are less likely to be promoted into leadership roles and more likely to have their contributions overlooked in team settings (Corbett &

Hill, 2015). These biases create an uneven playing field where women must work harder to gain recognition and credibility.

2. Workplace Culture and Inclusion

Many women in IT report experiencing exclusionary workplace cultures that prioritize male-dominated networking and informal decision-making processes (Cheryan et al., 2017). The lack of representation and support networks can lead to feelings of isolation, which negatively impact retention rates.

3. Gender Pay Gap

The gender pay gap in IT remains a persistent issue, with studies indicating that women earn less than their male counterparts in similar roles (Glass et al., 2020). Salary disparities can result from differences in negotiation practices, biases in performance evaluations, and fewer opportunities for promotions.

4. Work-Life Balance and Family Responsibilities

Women in IT often struggle with balancing career advancement and family responsibilities, especially in workplaces that demand long hours or lack flexible work policies. The lack of adequate parental leave and childcare support can discourage women from pursuing senior positions.

5. Limited Mentorship and Sponsorship

Mentorship and sponsorship are crucial for career growth, yet women in IT often have fewer opportunities to connect with senior leaders who can advocate for their advancement. Studies suggest that having strong mentorship networks significantly improves career retention and leadership opportunities for women (Ashcraft et al., 2016).

OBJECTIVES

1. To find the opinion of citizens on changes or initiatives that IT companies should implement to create a more equitable and supportive environment for women.
2. To survey the biggest challenges encountered as a woman working in the IT sector
3. To find if any practices or behaviors existing have either helped or hindered.

METHODOLOGY

A structured questionnaire was designed to gather responses from IT professionals across various organizations. The survey questions included opinions on workplace initiatives: identifying the changes and initiatives IT companies should implement to create a more equitable and supportive environment for women and understanding the key challenges encountered, such as gender bias, work-life balance, career progression, and workplace culture and evaluating whether current policies, behaviors, and corporate culture have helped or hindered women's experiences in the industry. The survey had mostly open-ended questions and the target population was women working in IT. Purposive and snowball sampling was done to reach a diverse pool of IT professionals and the mode of distribution was through Online platforms such as Google Forms, LinkedIn, and company mailing lists.

To gain deeper insights into personal experiences, challenges, and the effectiveness of company policies, semi-structured interviews in In-Depth Interviews were conducted with women professionals in IT and the participants were women in different roles and experience levels within IT companies. The Interview focus areas were personal experiences with workplace policies, perceived gaps in gender equity initiatives, and suggestions for improvements in policies and company culture. Data Analysis of analysis of interview transcripts was collected, and cleaned. Nvivo was used to prepare the word cloud output and sentimental analysis. As part of ethical considerations, the Data will be securely stored and used solely for research purposes.

DATA ANALYSIS

1. While analysing the biggest challenges encountered as a women working in the IT sector, the word cloud using NVIVO was as below



Figure 1: NVIVO output showing word Cloud for the response for greatest challenges encountered as a women working in the IT sector

Prominent Words (Larger Size – More Frequently Mentioned)

- *Career Slowdown*
- *Stagnant*
- *Maternal Bias*
- *Insubordination*
- *Male Dominated*
- *Children*

These words highlight that one of the biggest challenges women face in the IT sector is the slowdown of their careers after starting a family. Respondents reported experiencing maternal bias within their teams, with some even having their authority questioned after having children. Additionally, the lack of balanced team demographics forced them to navigate a predominantly male-dominated environment.

Moderately Frequent Words (Medium Size)

- *Career Pause*
- *Family Responsibilities*
- *Lack of access to Leadership*
- *Double Standards*
- *Male Dominated*
- *Twice as hard*

These words suggest the challenges associated with taking a career pause and rebuilding from scratch while balancing family responsibilities and professional commitments. Respondents highlighted the struggle to secure leadership opportunities, the difficulties of managing subordinates, and the need to work twice as hard to prove themselves in the workplace.

Less Frequent but Relevant Words (Smaller Size)

- *Technical Aptitude*
- *Minority*
- *Work Life Balance*
- *Irregular work hours*

These words highlight issues like being the minority, irregular work of recognition, difficulty proving capabilities, the need to juggle multiple roles, bureaucratic obstacles, gender biases (especially for young women).

Interpretation of the Challenges Women Face in IT

1. Career Slowdown and Stagnation

- **Career Slowdown & Stagnation** – The strong presence of words like slowdown, hard, stagnation suggest that many women experience a decline in career progression after starting a family.
- **Maternal Bias** – The presence of words like maternity, maternal bias, children suggest the bias that mothers are less committed to their work.
- **Insubordination** – The presence of words like twice as hard, need to prove oneself and insubordination suggests subordinates questioning their authority after having children.
- **Male-Dominated Industry** – The team size of the lack of gender diversity makes it harder for women to navigate and advance in their careers. The underrepresentation of women makes it harder to find mentors and career advocates.

2. Career Pauses and Leadership Barriers

- **Career Pause & Rebuilding** – Words like pause, hard to get back to the job market, family responsibility suggests the struggles to rebuild their career after a break.
- **Lack of Access to Leadership** – Words like *advance*, *prove*, *leadership*, and *recognition* indicate that women face difficulties in climbing the career ladder and receiving due credit for their work.
- **Double Standards** – Women often face stricter expectations compared to their male counterparts.
- **Working Twice as Hard** – Words such as pressure, expectations, unrealistic deadlines suggest the pressure to put in extra effort to prove their capabilities.

3. Work-Life Balance and Structural Challenges

- **Technical Aptitude Bias** – Words such as technical, aptitude, questioning suggest that women frequently have to prove their technical competence repeatedly
- **Work-Life Balance Struggles** – The inclusion of words like *takes*, *hard*, and *time* suggests that the workload and expectations in the IT sector are demanding, making it difficult to balance
- **Irregular Work Hours** – Words such as late night calls suggest the demanding nature of IT jobs, including late hours that create additional stress on health and well-being.

This NVIVO word cloud visually represents the key challenges women face in the IT sector, emphasizing work-life balance, career advancement struggles, gender biases, and time management issues. The data suggests a need for workplace policies that support women's career growth while accommodating their personal responsibilities.

2. When the obtained data was put in for sentiment analysis the overall sentiment of the response is negative, as it highlights challenges, biases, and systemic barriers faced by women in the IT sector.

Below is a breakdown of sentiment by category:

Career Progression & Leadership – Negative

Career slowdown after a break → Indicates stagnation and a setback

Lack of access to leadership → Suggests exclusion from opportunities

Struggles with influence and career advancement; needing to work twice as hard →

Highlights an unfair system requiring extra effort

Workplace Bias & Discrimination – Highly Negative

Pay disparity, bias, harassment, bureaucratic inequality → Strongly negative due to financial and systemic discrimination

Maternal bias → Indicates discrimination against mothers in career growth.

Risk of being labelled difficult for being assertive → Reflects gender double standards in professional behaviour.

Respect & Recognition – Negative

Longer time to earn respect and recognition → Implies ongoing struggles for acknowledgment.

Hard to gain respect from male subordinates and peers → Indicates gender-based challenges in authority and teamwork.

Work-Life Balance & Overwork – Negative

managing professional and personal responsibilities.

Late calls, juggling personal responsibilities → Indicates stress due to scheduling conflicts.

Long and irregular work hours, offshore team coordination → Suggests exhaustion and difficulty maintaining balance.

Lack of women in software engineering roles, leading to overworking to prove capability → Highlights pressure to over perform due to underrepresentation.

Overall Sentiment Score (Approximate Scale)

On a scale of -1 (very negative) to +1 (very positive), this response would likely fall between -0.8 to -0.9, indicating a strong negative sentiment. The response expresses frustration, inequality, and systemic barriers with no positive aspects mentioned

3. While analysing the responses for the question, how the above challenges impacted your career growth, the NVIVO output obtained was as follows

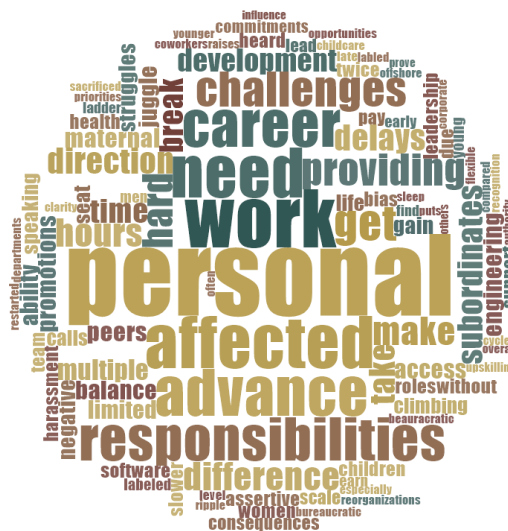


Figure 2: NVIVO output showing word Cloud for the response, how the above challenges impacted your career growth

Interpretation of Career Growth Impact

Work-Life Balance Struggles:

- The words *personal*, *balance*, *responsibilities*, and *affected* suggest that managing both personal and professional duties has negatively impacted career growth.
- The mention of *time*, *multiple*, and *hours* further emphasizes the difficulty in balancing work commitments with personal life.

Career Advancement Delays:

- The presence of *advance*, *delays*, *development*, and *climbing* implies that many women in the IT sector experience slow career progression due to structural barriers.
- The words *bureaucratic* and *leadership* indicate difficulties in breaking into leadership positions.

Lack of Recognition and Workplace Bias:

- Words like *difference*, *labelled*, *harassment*, and *assertive* suggest that biases and stereotypes create barriers for women in career growth.
- The inclusion of *health* and *sacrifices* indicates that workplace stress and personal compromises are common consequences of these challenges.

Limited Access to Opportunities:

- Words such as *access*, *roles*, and *providing* indicate that women face challenges in accessing career development resources and leadership positions.
- The presence of *subordinates* and *peers* suggests that hierarchical structures might also pose difficulties in career progression.

This word cloud effectively visualizes how challenges in the IT sector have negatively impacted women's career growth. The most significant effects include work-life balance struggles, delays in career progression, lack of recognition, and limited access to leadership roles. The findings suggest that structural and cultural changes are needed to create an equitable career growth environment for women in IT.

Sentiment Analysis Breakdown

Sentiment Score: -0.10 (Slightly Negative)

The response expresses challenges and barriers but does not have extreme negativity.

Words like "negative impact," "difficulty," and "limited opportunities" contribute to the negative sentiment.

Subjectivity Score: 0.23 (More Objective than Subjective)

The response is mostly fact-based, presenting workplace challenges in an informational and neutral tone rather than an emotional one.

The sentiment remains mildly negative, reflecting career struggles without being overly pessimistic or emotionally charged.

4. While analysing the responses for the question on how would you describe the inclusivity and supportiveness of your workplace culture, the NVIVO output obtained was as follows

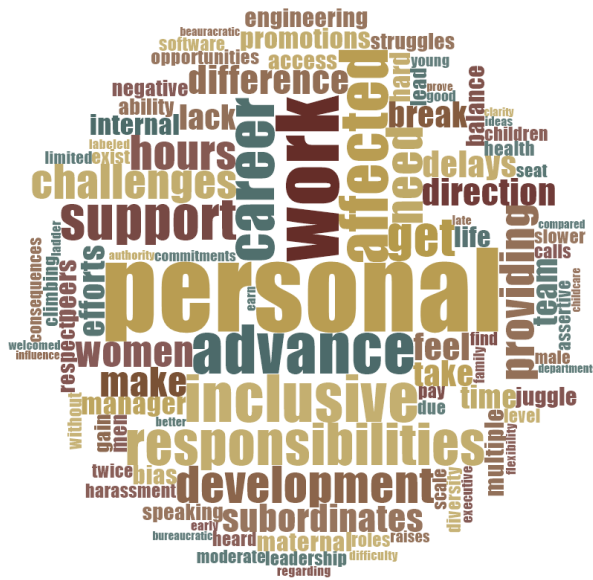


Figure 3: NVIVO output showing word Cloud for the response how would you describe the inclusivity and supportiveness of your workplace culture

Interpretation of Workplace Inclusivity and Supportiveness

Workplace Inclusivity is a Concern:

- The presence of *bias*, *difference*, and *lack* suggests that there are still gaps in making the workplace truly inclusive.
- Words like *providing*, *efforts*, and *commitments* imply that some organizations are making efforts toward inclusivity, but it may not be enough.

Career Growth & Advancement Barriers:

- Words like *advance*, *promotion*, *leadership*, and *delays* suggest that inclusivity issues impact career progression, particularly for women.
- *Limited access* to leadership roles and *barriers to development* seem to be common concerns.

Work-Life Balance & Support Challenges:

- The inclusion of *hours, juggle, break, and health* implies that workplace policies may not fully support employees in maintaining a healthy work-life balance.
 - *Providing and support* indicate that some companies are attempting to improve conditions, but challenges still persist.

Gender & Inclusivity Issues:

- Words like *women, harassment, subordinates, and male* suggest that gender inclusivity is a key issue.
- *Efforts and inclusive* show that some progress has been made, but *bias and challenges* indicate that more work is needed.

This word cloud suggests that while workplaces in the IT sector are making efforts toward inclusivity and supportiveness, significant challenges remain. Employees still face career advancement barriers, gender biases, work-life balance struggles, and leadership access issues. More concrete actions are needed to improve inclusivity and workplace support, particularly in leadership opportunities and eliminating biases.

Sentiment Analysis Breakdown

Sentiment Score: 0.33 (Moderately Positive)

The response contains positive elements such as "supportive," "inclusive," "valued opinions," and "friendly work environment."

However, some negative aspects like "fewer opportunities for women," "low representation," and "internal biases exist" bring the score down slightly.

Subjectivity Score: 0.62 (Moderately Subjective)

The response includes both factual statements and personal perspectives on inclusivity and workplace culture.

Words like "good and inclusive culture" and "supportive work culture" indicate opinions rather than objective facts.

The overall sentiment is moderately positive, reflecting progress in inclusivity and workplace support while still acknowledging existing challenges.

5. When the respondents were questioned on are there any specific practices or behaviours that have either helped or hindered, the responses received is listed below

- Micro management - when it's avoided it helps to perform better. When it's prevalent in the team, it hinders us.

- Communication and unbiased feedback.
- Staying patient in situations with difference of opinions and appreciating others for every small accomplishment
- Certainly being confident and assertive has helped
- Having a manager who avoided micromanaging and supported flexibility greatly benefited me in the latter part of my career.
- "Since we work remotely, there was an offline meetup/boot camp to work on a feature for a month that took place where couple of team members stayed at a place.
- Since I was the only woman, they had not asked me "
- If not my mother's help I wouldn't be here wherever I am.
- Helped in growth mind-set
- My cultural background to be a more submissive likable woman has definitely hindered me. My consistency, work ethics and hard work has helped me advance in my career
- Having a lot of women role models in the leadership role helps
- Leadership development programs for women
- Expectation to take all / meetings early morning and late evening to support the onshore team.
- Constant undermining of my technical skills.
- Having a manager who is a women and has young kids has helped as she understands the differnt roles that I juggle apart from being an employee of this company.
- Took a break after having kids and had to join at a lower position.

6. The NViVo output for the question In your opinion, what changes or initiatives could IT companies implement to create a more equitable and supportive environment for women is as below



Figure 4: NVIVO output showing word Cloud for the response of opinion, with regard to what changes or initiatives could IT companies implement to create a more equitable and supportive environment for women

Interpretation of Workplace Inclusivity and Supportiveness

Workplace Inclusivity is a Concern:

- The presence of *bias*, *difference*, and *lack* suggests that there are still gaps in making the workplace truly inclusive.
- Words like *providing*, *efforts*, and *commitments* imply that some organizations are making efforts toward inclusivity, but it may not be enough.

Career Growth & Advancement Barriers:

- Words like *advance*, *promotion*, *leadership*, and *delays* suggest that inclusivity issues impact career progression, particularly for women.
- *Limited access* to leadership roles and *barriers to development* seem to be common concerns.

Work-Life Balance & Support Challenges:

- The inclusion of *hours*, *juggle*, *break*, and *health* implies that workplace policies may not fully support employees in maintaining a healthy work-life balance.
- *Providing* and *support* indicate that some companies are attempting to improve conditions, but challenges still persist.

Gender & Inclusivity Issues:

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- *Efforts* and *inclusive* show that some progress has been made, but *bias* and *challenges* indicate that more work is needed.

This word cloud suggests that while workplaces in the IT sector are making efforts toward inclusivity and supportiveness, significant challenges remain. Employees still face career advancement barriers, gender biases, work-life balance struggles, and leadership access issues. More concrete actions are needed to improve inclusivity and workplace support, particularly in leadership opportunities and eliminating biases.

CONCLUSION

Addressing these challenges requires a concerted effort from educational institutions, employers, and policymakers. Initiatives such as STEM education programs for girls, inclusive hiring practices, and workplace policies that support work-life balance are essential in bridging the gender gap in IT. Organizations that prioritize diversity and inclusion not only foster a more equitable work environment but also benefit from the increased creativity and problem-solving capabilities that diverse teams bring.

As the IT sector continues to evolve, ensuring that women have equal opportunities to succeed will be vital in shaping a more inclusive and innovative industry. Future research should focus on measuring the effectiveness of diversity initiatives, understanding the impact of remote work on gender disparities, and identifying best practices for fostering equitable career progression in IT.

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