Tech's Gender Gap: A Critical Review of Women's Roles and Roadblocks

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Abstract: ***This paper aims at reviewing the changes in the position of women in the technology industry and the prospects and risks associated with it. Traditionally male-oriented, the IT sector has been developing the women's participation owing to increased demand for IT specialists and the implementation of measures aimed at gender equality. The paper's purpose is to determine major opportunities for women and list the major challenges they face. A literature review involved both peer-reviewed articles and industry reports; quantitative gender representation and wage comparison and qualitative examination of case studies were also used. The data suggests that the contemporary graduate women have benefited from Sales force's diversity programs and activities, including the Grace Hopper Celebration and other similar events launched by the company and other organizations, but still, key barriers, including, but not limited to, systematic sexism, framework bias, and wage disparity, persist. The study shows that existing interventions are useful at the present and underlines that there is more that needs to be done to improve working culture in technology, pointing out the direction for future research with the aim of narrowing gender gaps.***

Key Words: Gender Equality, Technology, Prospects, Challenges

1. INTRODUCTION

In the areas of technology, women have always been in the minority representing only a fraction of the whole. Traditionally the tech industry was a Boys' Club; the culture at large and organizational structures of companies eradicating women from joining and thriving in the technical profession (NCWIT, 2021). For women, the first couple of decades offered a professional social field of immense promise; in the following decades the profession grew more procedural and massively commercialized which sharply reduced the number of women in computing (Wajcman, 2004).

In the last few decades the representation of women in the tech industry has risen steadily but slowly because of the awareness and need for gender equality. Some of the measures taken to close the gender gap have included pushing for more women to go for STEM careers as they are educated or recruited (Pew Research Center, 2022). For example, there are Girls Who Code and Women Who Code that aim at launching girls and young women into technology careers and introducing ways that the females can be supported in their careers in the field (Girls Who Code, n. d. ; Women Who Code, n.d.).

However, there seem still exist huge hurdles in the process. Some of the barriers that women face while working in the technology industry include sexism and discrimination, unconscious bias, and limited role models for women in powerful leadership positions (TrustRadius, 2021; Hired, 2022). Women remain severely underrepresented in executive technical roles, reflecting the larger systems' problems within the industry (Microsoft, 2022).

In particular, this paper focuses on the role of women in the tech industry now and in the future, prospects and challenges, and solutions that are being undertaken in this regard. Through exploring the modern tendencies and considering the achievements as well as the challenges encountered for women in the technical industry, this article has set the goal to reveal the current state and the future prospects of gender equality in tech.

Objectives: The focus of this study was on **b**ridging the gender gap in technology. It is a review paper on contributions and industry challenges faced by women. Subsequent are the sub objectives of the study:

- To conduct a gender analysis of representation in the tech sector
- To examine the possibilities to find a place for women in the IT sector
- To explore issues that affect female employees in the technology sector
- To assess feedback and outcomes
- To propose directions for future research

Research Methodology: This research incorporated a mix of quantitative and qualitative techniques only because this work was conceived out of this idea. The following academic articles and research, industry reports, and news articles were analyzed to establish gender diversity in the tech industry: These included reports from McKinsey & Company, NCWIT, Trust Radius, and Hired. The quantitative data were obtained with surveys conducted to women in tech and analyzing diversity initiatives of companies such as Sales force and Microsoft. The study analyzed this by focusing on programs implemented by various companies, which include Google through Women Tech makers, the Grace Hopper Celebration, and Girls Who Code. The success of these strategies and solutions can be judged with the help of the results of diversity endeavors, mentoring, and education services.

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Review of Literature: One unrecognized fact regarding relations between gender and computing is that women played a significant role in the creation, installation, and programming of early computing systems. For example, Ada Lovelace has been acclaimed as one of the first computer programmers due to work she did on the early mechanical general-purpose computer named the Analytical Engine of Charles Babbage (Toole, 1998). During World War II, women like the ENIAC programmers—Katherine Johnson, Dorothy Vaughan, and Mary Jackson—had important roles in computing tasks that were essential for the war (Shetterly 2016).

Nevertheless, as the computing industry shifted from academia to the commercial market as a profession from the 1960s to the 1970s, cultural and structural barriers started to develop, and that excluded most women from participating in it. Other factors that helped to contribute to this trend include the implementation of the corporate culture and the increasing perception of tech-oriented jobs as more suitable for men rather than for women. The ratios shift in the direction of the men, and from 1980, women get a lower ratio in degrees of computer science and other related fields. This decline was attributed to reasons such as reinforcement of the gender stereotype thesis and poor working conditions provided to women in technical positions (Margolis & Fisher, 2002).

The decline in the number of females entering the tech field continued up to the early 1990s and 2000. Studies pointed out that women were first observed to enter the computing profession in large numbers but were, however, gradually precipitated or effected their exit or resignation due to the hostilities, rude working environments, and little prospects for career growth (Beyer et al., 2009).

The final two decades have witnessed a slow but sure reversal of this trend due to more rising sensitization on matters concerning gender diversity and affirmative action in STEM fields. Such women-oriented programs like the attraction of young women to technology careers as well as the promotion of workplace diversity have played a role towards gradual progression to higher women's participation in technological fields (National Center for Women & Information Technology, 2021). Nevertheless, the equality of the genders has continued to be a thorny issue and has not been achieved. Development of technology has been a male preserve in the past, but in the last few decades, women have been taking up the positions. This shift is predominantly to blame on an enhanced uptake of IT employees boosted by the active call for gender equality. An increasing number of women get employed in the technology sector as technology has grown to encompass software engineering, data analysis, and new careers such as cyber security. For example, as pointed out by the World Economic Forum, there is a report that indicates that the technology industry is projected to generate a new job every year by 12%, and this will help in promoting employment amongst women (World Economic Forum, 2023). There are also numerous diversity and inclusion programs that have been developed to protect women, including the IBM Women of Design and Technology program and Intel policies for the improvement of the number as well as the recurrence of ladies in new innovation vocations (IBM, 2023; Intel, 2023).

However, many challenges continue to be observed that affect women in the technology industry. Getting real and personal discrimination, both in respects to gender and unconscious bias, it remains rampant in their working lives. A survey by the National Center for Women & Information Technology (NCWIT) reveals that women in technology careers bear the brunt of stereotypes and bias, resulting in career stagnation (NCWIT, 2022). Also, there is still a shortage of female examples and workplace sponsors, which push women away from promotions and high spheres. It also reflected the industry's high expectations for work performance, which often puts enormous pressure on women and others, especially caregivers. Wage inequalities are also an issue of debate, as are males paid slightly less than the female counterpart; the ladies are paid about 4% less than their male counterparts in similar technical positions as outlined in the 2023 Gender Pay Gap Report.

In order to tackle these challenges, various strategies have been employed as follows: For instance, Adobe declared they will eliminate the gender pay gap by yearly active review and rectification; 'Salesforce' implemented a program to advance women towards management positions (Adobe, 2023; Salesforce, 2023). Industry and academic conferences for women in computing, for example, the AnitaB.org's Grace Hopper Celebration, bring both networking and professional development to women, while anti-status quo parties like the Association for Computing Machinery attempt to become systemic about their support for women (AnitaB.org, 2023; ACM, 2023). Also, there are educational programs such as Code.org, which has the vision of positively influencing young women and preparing them for the tech world, hence tackling the problem from the base (Code.org, 2023). The above-mentioned strategies are hereby useful in mentoring women to enable them to penetrate into the tech industry and become leaders.

This gives an overall picture of how women were involved in computing antiquity and the causes that led to the change in their involvement.

Current Statistics: Currently, women occupy about 28% of the total technology employment worldwide which is a slightly improved performance from the earlier years. However, women are still underrepresented in the higher technical and leadership hierarchial positions to date. For example, only one in five CIOs is a woman, and 41 percent of women working in the technology sector said that they have experienced Tech Hate Crimes at their workplace, (NCWIT, 2023).

Gender diversity in leadership, especially in technology companies, has long been an area of concern. In the field of

technical occupations, women have quite recently achieved some success despite the following barriers towards their promotion to leadership level. Some of the causes of this disparity are biased talent management, unequal opportunities during the hiring and promotions, chronic mentorship and sponsorship gaps, and workplace cultures that do not support a healthy work-life balance (Pew Research Center, 2022).

To address these imbalances, some of the approaches being implemented include those that are informational and recruiting of female candidates in technology education, employment, and training. For instance, such organizations as Women Who Code and Girls Who Code have been established to support and promote women's careers in technology and help to overcome the mentioned barriers (Women Who Code, n. d.; Girls Who Code, n. d.). Nonetheless, expanding gender parity in technology remains a problem, as evidenced by the latest statistics, and work persistence is needed to produce increased employment rates for women in technology.

Importance of Diversity: The roles regarding inclusion of diversity in the tech industry are not only ethical; this factor has enormous business implications concerning product development, decision-making, and commercial success in key target markets. Cross-cultural working groups have been found to have different talent and backgrounds, hence increasing the chances of coming up with better ideas and solutions. For example, diverse teams are better equipped to create and generate ideas and designs that are appropriate to a wide range of users. This diversity of thought assists when designing products and services that address a diverse population or culture (Herring, 2009).

According to groundbreaking research conducted by McKinsey & Company, global organizations that were racially and ethnically diverse had a 35 percent probability of attaining better financial performances than the companies that lacked a high density of diversity (Hunt et al., 2015). Second, gender diversity is also cited to enhance financial performance, whereby companies that hire women on their leadership boards demonstrate better business performance (Desvaux et al., 2008).

Finally, diverse groups outperform second-best competitors since they come up with coherent decisions by integrating different perspectives; the absence of groupthink hence makes it easier to realize sound analysis and new ideas (Page, 2007). This enhanced decision-making capacity is helpful in a technology context since it is vital to be aware of the full range of users to consider when designing user-centered products that can compete effectively in today's market.

To support diversity within any tech organization, it not only improves the workplace options and encourages individuals to participate but also organizes the tech organizations for better business performance, as diversity is successful in improving innovation, decision-making, and the market perspective (Catalyst, 2021). Moving forward into the future and as the technology industry becomes more competitive, it is the key to the success and stability of organizations to come up with a diverse work force to respond well to the global challenge.

Opportunities for Women in Tech: Several reasons can be noted as to why women are able to secure jobs in the tech industry: growth of the industry, supportive policies for diversity, and creation of fields that are yet to have the gender gap defined.

1. **Growth in Tech Demand:** It has been observed that the tech industry is expanding at a very good pace, and therefore there is a huge demand for talented individuals in almost all the fields, such as software engineering, data analytics, IT security, etc. Information from the U.S. Bureau of Labor Statistics shows that employment in software development is expected to grow by about 22 percent within the year period 2020–2030, a growth rate that is much faster than the average for all occupations. Some of the reasons for its rapid growth are the new possibilities that appeared for women to start a new career or promote in the field of technology. Employers are actively participating in the hiring of such talent to give solutions to the issues of gender gaps in the labor market.

2. **Diversity and Inclusion Programs:** Almost all firms in the technology industry have put measures such as the D&I measures in place with the aim of increasing the employment rate of women. Such measures may include sponsorship for women, search for female talent, and Lesbians, Blacks, Asians, and Southern Pacific Islanders (LBASP) invitation to work for organizations and specially formed women groups within the work place. For example, the Women Techmakers initiative of Google provides relevant performance and social support to female tech employees and IT entrepreneurs with the aim to improve their performance and to provide them with good networks (Google, n. d.).

3. **Networking and Mentorship Opportunities**: There are programs such as women who code, girls who code, and AnitaB.org that provide significant opportunities for socialization and professional learning as well as apprenticeship. These organizations are very relevant in guiding women on their job paths, especially in organizations dominated by men. Available literature shows that mentorship could potentially raise levels of job satisfaction and career advancement because of the support that a smaller number of people may receive in their work (Dreher & Cox, 2018).

4. **Emerging Technologies:** Fresh and growing industries like AI, ML, and blockchain offer women a chance of getting into new professions and putting gender disparities in the growing industries for women to embrace. Other such organizations include AI4ALL with the mission to

promote the cause of underrepresented minorities in AI by offering education as well as mentorship to women (AI4ALL, n. d.). Such an approach ensures that women are ready to participate as well as shape these developing technologies from their initial stages.

Key Issues Faced by Women Working in Technology: The advancement of women in the tech sector is, however, faced with the following major hurdles, regardless of the available opportunities: Some of the challenges women face include sexual harassment and discrimination, low recognition of women in leadership positions, struggle in balancing between family responsibilities and their jobs, low wages and salaries compared to their male counterparts, and limited chances to work on large recognition projects.

1. **Sexism and unconscious bias:** Sexism and other similar biases have been two key problems, which remain even today in the world of technology. Sexism seems to be actually present in that people who hired women for technical careers never cease to remind them that they do not have to be as good as men in these occupations. According to a survey conducted in the TrustRadius (2023) study, the survey highlighted that 72% of women in the tech industry have faced gender discriminations, which are apparent in hiring and promotion policies and even in general workplace relations. This bias may negatively affect women and keep holding them back when it comes to the opportunities for career promotion.

2. **Lower levels of access to female role models and mentors:** There are very few women role models, especially within the age bracket of being able to aspire to be in senior positions, which makes it difficult for young women in technology to have mentors. There is no woman in the senior leadership team, which may be a deterrent to women achieving seniority or remaining in the field. The study shows that the lack of role models or mentors is one of the crucial factors for career development, and women are deprived of that opportunity (Ragins & Cotton, 1999).

3. **Women, Work-Family Conflict, and the Continuing Struggle for Fair Employment Policies:** Tech culture still maintains high expectations from employees, and this is a challenge for women considering that most of them have family responsibilities. Flexible working arrangements and family-friendly policies do not exist, thus forcing most women to struggle when it comes to the division of workplace and home responsibilities. Of course, this rigidity increases women's turnover and harms their career mobility in the long run (McKinsey & Company, 2021).

4. **Wage and advancement disparities:** With equal educational background and work experience, the women employees in IT industries receive less remuneration than males. According to Lerman Solomon, the 2022 State of Wage Inequality report by Hired shows women in tech get paid 3% less than men in the same position. Women still earn less than men in other levels of the workforce, and this inequality sharply increases with junior and senior professions; besides, women are promoted to leadership positions less frequently than men, which leave gender inequality in the IT field (Hired, 2022).

5. **Limited access to high-visibility projects:** It has been observed that women get less opportunity to undertake those projects and also get less exposure to the clients than their male counterparts, which are prerequisites for promotions. This may limit their potential to seek exposure and experience and acquire new opportunities to advance to higher levels in the company. As a result, this leads to a cycle of embedding inequalities in the representations, particularly in senior positions, and thus continues the cycle of gender disparities in the technological fields (Kalev et al., 2006).

Responses and Solutions: In order to be able to solve the complex problems that women experience in the technology sector, organizations and firms have been adopting measures as discussed below. Some of these strategies are anti-harassment policies, affirmative action, training, and development for women in the IT field, as well as awareness creation on equality of women in the technology field.

1. **Corporate Initiatives:** Larger tech companies have made powerful measures towards rectifying gender divides through corporate-specific strategies. For example, Salesforce has been keen on dealing with wage disparity in a conclusive manner by practicing pay review exercises and consequently, implementing changes when establishing wage disparities between the genders, whereby Salesforce has insisted on paying men and women equally (Salesforce, 2021).

This way also aids in the prevention of wage differences, something that shows that organizations are prepared to equalize their employees' wages. Likewise, to address D&I, the company has come up with far-reaching goals that would seek to enhance women's representation in technical and leadership positions in the organization. Microsoft's D&I initiatives are a form of a more significant business transformation process that aims at making the company's workplace more diverse; they comprise other practices such as founder-mentoring, diversity training, and community outreach (Microsoft, 2022).

2. **Conferences and Advocacy:** This is an important event and very instrumental in the growth of women in technology, such as through the Grace Hopper Celebration of Women in Computing. This annual conference is organized by the AnitaB. Being coordinated by the AnitaBorg in partnership with the Association for Computing Machinery (ACM), thousands of women from

all parts of the globe attend the event, where they are provided with access to employment and events such as workshops that will be useful in their careers (Grace Hopper Celebration, 2023). These meetings are essential to create networks, understand, and encourage more women to be innovative in the development of new technologies.

Nonprofit organizations are another factor in the promotion of the cause of gender equality in the industry. These associations include Women in Technology International, or WITI, and The National Center for Women & Information Technology, or NCWIT, to name but a few, which advocate for policy changes, corporate profiling, and support for various programs that seek to promote a diversity of the technology sector (NCWIT, 2023).

3. **Education and Early Exposure:** Raising girl's awareness of technology begins in childhood, and this comes with early participation in STEM courses. Some of the programs include Girls Who Code, programs that are mainly focused on making young girls embrace computer science and related technology by enhancing their skills and confidence in technological careers (Girls Who Code, 2022). Some of these efforts offer coding lessons, camps, as well as after-school programs that educate girls on how to code and encourage them to pursue careers in technology.

   These programs are intended to redesign the flow of talent, especially for technology-related fields, through providing early education and favorable conditions for young women.

2. RESULTS

1. **Current State of Gender Representation:** Current State of Gender Representation: Currently, women have a representation of 28% in the technology sector across the world. Increased representation in leadership positions is still limited, with women occupying only 18% of CIO positions across giant companies in the United States, as per the Fortune 500 companies Statista (2023).

2. **Opportunities for Women:** The advancement of the technology industry has improved the employment rate for women since it provides employment for learners in specific fields after acquiring the necessary vocational skills. For instance, the U.S. Bureau of Labor Statistics forecasts that employment in software development will grow by 22 percent between 2020 and 2030. There are programs in place by companies that instigate organization diversity and inclusion to conduct initiatives that provide specific support and recognition for women. Some ways that have proved to be effective in bringing women into the tech scene include Women Techmakers by Google and mentorship programs from Women Who Code, among other advances (Google, 2023; Women Who Code, 2022).

3. **Challenges Faced by Women:** Some of the issues that women in tech experience include sexism and unconscious bias. Case in point: 72% of women said they had experienced gender discrimination (TrustRadius, 2023). Work-life balance continues to be another factor, as the technical nature of the jobs is likely to take a toll on women, more so those with family responsibilities. Salary discrimination increases, and women in technology occupations are paid 3% less than men. Women also struggle to get promotions as well as secure the high-profile projects (Hired, 2022).

4. **Effectiveness of Responses:** Many big corporations have taken measures such as pay equity audits by Salesforce and extensive diversity plans by Microsoft that have had a positive impact towards reduction of wage gaps and employment of women in technical positions (Salesforce, 2021; Microsoft, 2022). Other events like conferences (Grace Hopper Celebration) and education programs (Girls Who Code) have been pertinent in offering networks and an early introduction to IT careers, thus providing a boost to the women's career path (Grace Hopper Celebration, 2023; Girls Who Code, 2022).

Scope for Future Research: More research should be directed to the sustainability of diversity and inclusion initiatives, the multiplicative nature of the issues affecting women in technology, and how remote working is influencing the area of gender diversity. Hence, assessing policy modifications and the types of mentoring may provide further directions for enhancing gender equity in the technology sector.

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