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# Artificial Intelligence, Big Data, and Cloud Infrastructures: Policy Recommendations for Enhancing Women's Participation in the Tech-Driven Economy

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*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

This study investigates the underrepresentation of women in Artificial Intelligence (AI), Big Data, and Cloud Infrastructures, exploring the barriers and challenges they face and assessing the effectiveness of current policies and initiatives to promote gender diversity within the tech industry. Employing quantitative research methods, the study used a survey distributed to 572 female professionals in tech-related roles across various industries, achieving a 67.9% response rate. Multiple regression analysis was utilized to test four main hypotheses concerning barriers to entry and advancement, the inclusivity of educational programs, the impact of diverse teams on innovation and performance, and the effectiveness of gender-inclusive policies. Key findings indicate that the type of organization and specific tech sectors significantly influence the barriers experienced by women. Notably, gender diversity within teams correlates strongly with improved innovation and performance. However, educational and training programs often fail to be sufficiently inclusive, underscoring the need for programs better tailored to women's needs in tech fields. Moreover, the study confirms that implementing gender-inclusive policies substantially increases women's participation in tech roles, especially when these policies are applied long-term. Based on the findings, recommendations are made for adopting comprehensive, inclusive practices at organizational and educational levels, promoting diversity in team composition and leadership, committing long-term to effective policy implementation, and developing supportive networks through mentorship and sponsorship programs. These measures are aimed at reducing gender disparities and enhancing the integration of women into the high-tech economy. The study underscores the critical role that strategic policy-making and organizational change play in fostering an inclusive tech environment that not only addresses gender disparities but also enhances overall industry innovation and performance.

*Keywords: Artificial intelligence; big data; cloud infrastructures; women in technology; gender diversity; inclusivity; tech industry policies.*

## 1. INTRODUCTION

As the nature and scope of work evolve in recent times due to advancements in digital technology and workplace reforms, women encounter a myriad of challenges, spanning the gender digital divide, pay disparities, and instances of harassment [1]. Recent research studies in the US job market have highlighted that gender discrimination constitutes a significant workplace challenge, with 73% of surveyed workers affirming discrimination among women in tech-related roles [2]. This discrimination manifests in varied forms, including biased treatment, stereotyping, and exclusion from decision-making processes [3,5]. A notable percentage of women in the tech sector report experiencing discrimination based on their technical abilities, highlighting a pervasive bias against their competence and expertise in technical domains [2]. According to Ali et al. [4], these challenges impede women's career progression and job satisfaction in technology and contribute to perpetuating a culture marked by inequality and exclusion within the industry.

However, amid these challenges, the underrepresentation of women in the dynamic tech-driven economy, characterized by the integration of Artificial Intelligence (AI), Big Data, and Cloud Infrastructures, presents a more significant workforce challenge [5]. The transformative impact of these technological elements on industries and societies is undeniable as Artificial Intelligence, characterized by its ability to simulate human intelligence in machines, stands as a cornerstone of modern technological advancement, spanning a broad spectrum, encompassing basic algorithms to intricate neural networks, with applications in diverse sectors such as healthcare, finance, and transportation [5]. According to Sestino et al. [6], in parallel with the rise of AI, the explosion of Big Data has revolutionized information management. Defined by vast and complex datasets, Big Data has become a valuable source of insights, particularly in understanding human behavior and interactions, as continuous generation of information by digital platforms and Internet of Things (IoT) devices empowers organizations to uncover trends and patterns that were previously elusive [6]. Big Data analytics provides businesses and governments with tools to make informed, strategic decisions, fostering a data-centric approach to problem-solving.

Complementing AI and Big Data is the evolution of Cloud Infrastructures, a paradigm shift in computing that delivers various services over the internet, significantly altering the IT landscape [7].

Despite the transformative potential of these technologies, the underrepresentation of women in the tech-driven economy remains a pressing concern. The disparity in women's participation is not solely a matter of social equity but also poses a risk of losing diverse perspectives and innovation in technology development [5]. Recognizing the urgency of addressing these challenges, USAID, in collaboration with the Bill & Melinda Gates Foundation, launched the Women in the Digital Economy Fund (WiDEF) [8]. The WiDEF Initiative is a collaborative effort involving governments, private sector companies, foundations, civil society, and multilateral organizations to expedite progress towards gender digital equality [9].

The potential benefits of digital technologies, particularly for women workers and entrepreneurs facing caregiving responsibilities or mobility constraints, highlight the importance of creating supportive work environments [10]. Efforts to mitigate these challenges require a multifaceted approach, encompassing organizational policies, cultural shifts, and targeted interventions to promote gender diversity. Establishing a supportive and respectful workplace environment for all individuals in the technology sector is imperative for fostering inclusivity and ensuring the full realization of the potential offered by digital technologies [11].

The underrepresentation of women in these critical sectors raises concerns about the inclusivity and diversity of the tech-driven economy, potentially leading to technology solutions that do not fully consider the needs and perspectives of half the population. Additionally, this gender disparity may also hinder economic growth and innovation, as diverse teams are known to enhance creativity and problem-solving. According to USAID, one of the major barriers to women's participation in the tech-driven economy is the gender digital divide, particularly acute in developing and underdeveloped countries [9]. The gap in internet usage between men and women in these regions indicates the broader issue of access to digital resources and education. This divide is not just about connectivity but also encompasses a lack of digital literacy and advanced technology skills among women, which are crucial for leveraging digital tools for entrepreneurship and employment [8].

Moreover, this gender imbalance in tech sectors like AI, Big Data, and Cloud Computing is not just a problem of social equity; it is also potentially detrimental to the broader views of technological advancement and economic growth. Diverse teams, including those with a balanced representation of genders, are known to enhance creativity, improve problem-solving, and foster innovative solutions [8]. Therefore, the lack of female participation may lead to the development of technology solutions that fail to consider the needs and perspectives of a significant portion of the population, thereby limiting the scope and applicability of these technologies. Therefore, this study aims to systematically investigate and analyze the factors contributing to the underrepresentation of women in the fields of Artificial Intelligence (AI), Big Data, and Cloud Infrastructures, present a comprehensive understanding of the barriers and challenges women face in these tech-driven sectors and evaluate the impact of current policies and initiatives on promoting gender diversity within the tech industry. The objectives of the study include:

1. To comprehensively analyze the level of involvement and roles of women in tech-driven fields within specific regions.
2. To critically examine the existing strategies and programs implemented by governments, educational institutions, and corporations to promote gender diversity in technology.
3. To identify and understand the multifaceted factors that hinder women's entry and advancement in technology-driven fields.
4. To develop actionable steps and strategies to effectively implement recommended policies and initiatives aimed at promoting gender diversity in technology.

## 1.1 Research Hypotheses

**$H_1$:** Due to existing societal and organizational biases, women face more significant barriers than men in entering and advancing in Artificial Intelligence, Big Data, and Cloud Infrastructures.

**$H_2$:** Educational and training programs in AI, Big Data, and Cloud Infrastructures are not

adequately tailored to encourage and support the inclusion of women in these fields.

**$H_3$:** Companies with diverse teams, including higher representation of women in AI, Big Data, and Cloud Infrastructure roles, demonstrate better innovation and performance compared to less diverse counterparts.

**$H_4$:** Effective implementation of gender-inclusive policies and initiatives significantly increases the participation of women in AI, Big Data, and Cloud Infrastructure roles within organizations.

## 2. LITERATURE REVIEW

### 2.1 The Rise of Tech Giants

The dynamic integration of artificial intelligence, big data, and cloud computing has ushered in a transformative era in the economy. Tech giants harness these technologies to redefine industries, propel innovation, and shape the future of business and society [12]. The synergy of AI, big data, and the cloud is not merely an evolution but a revolution, marking a paradigm shift in how we perceive and navigate the digital landscape. At the heart of this revolution is the symbiotic relationship between AI and big data, facilitated by the expansive capabilities of cloud computing [13]. Gill et al. [13] further expatiate that artificial intelligence, with its ability to analyze vast datasets and extract meaningful insights, has become the linchpin of informed decision-making. Whether it's predictive analytics, natural language processing, or machine learning, AI unleashes unprecedented possibilities for businesses to optimize operations, personalize customer experiences, and drive strategic planning [13,14].

According to Thomson and Anderson [15], big data serves as the lifeblood of AI systems, providing the raw material for algorithms to learn and adapt. The sheer volume, velocity, and variety of data generated in today's hyper-connected world present both a challenge and an opportunity. Harnessing this data deluge empowers organizations to understand market trends, consumer behaviors, and operational inefficiencies comprehensively. The fusion of AI and big data transforms these raw data points into actionable intelligence, propelling organizations toward data-driven decision-making [15,16,17].

In addition, cloud computing acts as the enabler, providing the scalable infrastructure needed to support the computational demands of AI and the storage requirements of big data [13]. The cloud offers a flexible and cost-effective solution, allowing businesses to access computing resources on demand without significant upfront investments. This democratization of computing power has leveled the playing field, enabling startups and enterprises alike to harness the potential of AI and big data without prohibitive infrastructure costs [18,19].

AI, big data, and cloud computing constitute a formidable force driving innovation across industries, from healthcare and finance to manufacturing and logistics; the impact is pervasive [20]. Arigbabu et al. [21] elucidate that AI-powered diagnostics enhance accuracy in healthcare, while big data enables personalized treatment plans. Financial institutions leverage predictive analytics to assess risk, and cloud-based platforms facilitate secure and seamless transactions. Manufacturing processes are optimized through AI-driven predictive maintenance, with cloud solutions ensuring real-time collaboration and data accessibility [22,23].

### 2.2 The Gender Gap in Tech-Driven Fields

According to Mhlanga [5], despite the remarkable technological strides, a disturbing reality persists – the underrepresentation of women in AI, big data, and cloud computing. This gender gap raises critical questions about diversity and inclusion, as women remain conspicuously absent from key roles and decision-making positions in these fields [24]. In addressing this disparity, Sreevas and Kulkarni [25] suggest that it is not just a matter of equality; it is essential for unlocking the full spectrum of talent and perspectives needed for comprehensive technological advancement. Moreover, the significance of diversity goes beyond mere representation, as research has consistently demonstrated that diverse teams drive better business outcomes [26,27]. Gutterman [28] highlights that companies with inclusive cultures prioritizing diversity in leadership are more likely to outperform their peers. In the context of AI and big data, where decision-making algorithms impact various facets of society, diversity in developing and implementing these technologies becomes imperative to avoid perpetuating biases and promoting fairness [29,30].

According to the discussion above, a pronounced gender gap prevails in tech-driven fields, evidenced by global statistics revealing a significant underrepresentation of women in AI, Big Data, and Cloud Computing [31]. Recent data indicates that women constitute a disproportionately low percentage of professionals in these domains, limiting the diversity of thought and expertise and extending beyond developed nations, with developing countries facing a compounded challenge due to gender and digital divides [32,33].

In examining the study, it becomes evident that regional disparities exacerbate the gender gap; developing countries, in particular, grapple with pronounced challenges where women face limited access to technology and systemic barriers hindering their entry into tech-related professions [34,35]. Bridging this gap requires robust strategies that address both gender and digital inequalities concurrently. Numerous authoritative research studies and reports corroborate the severity of the gender gap in tech. For instance, studies by organizations like the World Economic Forum and UNESCO highlight the persistent underrepresentation of women, emphasizing the urgent need for comprehensive interventions [36,37].

Davila Dos Santos et al. [38] further expatiate the gender gap in tech that translates into a notable absence of women's voices in the design and development of technology solutions. This imbalance contributes to biased and incomplete outcomes, as products and services tend to reflect the perspectives of a narrow demographic. According to Schwartz [39], without diverse input, algorithms and innovations may inadvertently perpetuate existing biases, posing ethical concerns and limiting the applicability of technology for diverse user groups. The repercussions of the gender gap extend far beyond statistics. Snowball et al. [40] emphasize that excluding women from pivotal tech domains may result in a loss of diverse viewpoints, hindering innovation and creativity. The consequence is not only limited to the tech industry; it permeates societal structures, contributing to broader inequities [41,42]. Fostering gender diversity is not just a moral imperative; it is a strategic necessity for unlocking the full potential of technology and ensuring a more equitable and sustainable future.

In addition, the limited participation of women in AI, Big Data, and Cloud Computing directly hampers economic growth and stifles the full potential of innovation. Research consistently demonstrates that diverse teams, including women, foster greater creativity and problem-solving [10,25,30]. The exclusion of women from key tech roles hinders the industry's ability to address complex challenges and diminishes the overall economic impact of these transformative technologies. Notably, when crafted with limited female input, Kumar [51] asserts that AI algorithms can inadvertently perpetuate gender stereotypes and overlook female-specific needs. Instances abound where algorithms exhibit hiring, healthcare, and finance biases, reflecting and reinforcing societal gender norms [43]. Addressing the gender gap is crucial for ethical considerations and ensuring the development of fair and inclusive technologies that cater to the diverse needs of all individuals.

## 2.3 Barriers to Women's Participation in Tech

According to Zhang [44], within tech companies, unconscious gender bias significantly influences hiring, promotion, and decision-making processes; despite efforts towards diversity, subtle biases persist, affecting evaluations and opportunities. These biases reinforce existing gender imbalances within organizations and the society at large, hindering the advancement of women in tech [44,45]. Acknowledging and addressing these biases is imperative for fostering truly inclusive workplaces. Research highlights the pervasive "stereotype threat" phenomenon, where awareness of negative stereotypes about women's abilities can impact their performance and confidence. In tech environments, this threat exacerbates the challenges women face, influencing their professional trajectories [46,47]. Creating environments that actively counteract stereotype threats is essential for unlocking the full potential of female professionals in these fields.

Galsanjigmed and Sekiguchi [48], in analyzing workplace cultures, reveal instances where women are discouraged from pursuing careers in AI, Big Data, and Cloud Computing. These discouragements manifest through subtle biases, lack of mentorship, and limited opportunities. Fostering an inclusive culture requires dismantling these barriers, providing support mechanisms, and promoting environments where women feel empowered to contribute and thrive. The educational sector in AI, Big Data, and Cloud Computing faces a significant challenge

with the absence of gender-inclusive programs [49,50].

Traditional curricula often fail to address the specific needs and perspectives of women in these fields. Creating inclusive educational environments requires a paradigm shift, incorporating diverse voices and experiences to ensure that training programs cater to the needs of all aspiring professionals, irrespective of gender [49,50]. The scarcity of female role models and mentors in AI, Big Data, and Cloud Computing contributes to the challenges faced by aspiring women in these fields. Limited visibility of successful women impedes the formation of supportive networks and deprives students of valuable guidance. Elevating and showcasing diverse female leaders is essential for inspiring the next generation, breaking stereotypes, and fostering a sense of belonging in the tech industry [51,52].

Gill et al. [13] highlight an additional hurdle that emerges from potential gender bias in the design and delivery of tech-related educational programs. From course content to teaching methods, subtle biases may unintentionally discourage women from pursuing these fields. Addressing this requires a critical examination of program design, ensuring it is inclusive and free from stereotypes. By fostering an equitable learning environment, educational institutions can play a pivotal role in encouraging women to thrive in AI, Big Data, and Cloud Computing. Balancing work and family is challenging for women in demanding tech careers. Juggling professional responsibilities with family duties often results in a delicate circumstance. The pressure to excel in tech, coupled with societal expectations, can create a formidable barrier for women striving to maintain a harmonious work-life balance [53,54].

In addition, the lack of affordable and accessible childcare options poses a significant obstacle for women in tech. Limited availability and high costs hinder career mobility and perpetuate gender imbalances. Addressing this issue requires a comprehensive approach, advocating for affordable childcare solutions that empower women to pursue their careers without compromising family responsibilities [56,55].

Furthermore, to mitigate work-life balance challenges, flexible work arrangements and supportive workplace policies are imperative. Companies must prioritize creating environments that accommodate diverse family needs. Flexible schedules, remote work options, and parental leave policies can empower women in tech to navigate their professional journeys while fulfilling family obligations. Acknowledging the significance of work-life balance fosters a more inclusive and resilient tech workforce [57,58].

## 2.4 Educational Pathways and Skill Development for Women in Tech

STEM education plays a pivotal role in shaping the trajectory of girls' and women's interest in tech-related careers, particularly in the fields of AI, Big Data, and Cloud computing [59]. The foundations laid during early education significantly influence the choices individuals make later in life. Unfortunately, gender disparities persist in STEM classrooms, where girls may face stereotypes and biases that discourage their active engagement in science and technology [60].

According to Batty and Reilly [61], analyzing the role of STEM education involves recognizing the barriers that hinder girls' access to STEM subjects. By challenging stereotypes and fostering an inclusive learning environment, educators can inspire girls to pursue STEM interests. Hands-on activities, mentorship programs, and exposure to successful women in STEM can break down preconceived notions, encouraging girls to envision themselves as future contributors to the tech industry [60].

The integration of real-world applications and practical experiences within STEM curricula is vital. Connecting theoretical knowledge to its practical applications in AI, Big Data, and Cloud computing can demonstrate the tangible impact of these fields, making them more appealing to young girls [14]. Additionally, highlighting the societal relevance and positive contributions of tech-related careers can motivate girls to view STEM education as a pathway to meaningful and impactful professions [20].

According to USAID [5], various initiatives and programs aim to bridge the gender gap in AI, Big Data, and Cloud-related education and training. These initiatives often begin at the grassroots level, targeting schools and communities to instill an early interest in tech-related fields among girls. Investigating these initiatives involves understanding their multifaceted approaches [6]. Coding clubs, robotics competitions, and STEM-focused extracurricular activities provide hands-

on experiences that spark interest. Organizations like Girls Who Code, Code.org, and TechGirlz focus specifically on empowering girls with coding skills and fostering an early passion for technology [62]. Partnerships between educational institutions and industry leaders also contribute to girls' exposure to real-world applications of AI, Big Data, and Cloud technologies. Programs that bring female professionals into schools as mentors or organize field trips to tech companies expose girls to diverse role models, illustrating the range of opportunities available to them in these fields [62].

Assessing the effectiveness of these interventions requires a comprehensive evaluation of their impact on equipping women with the necessary skills and knowledge for success in tech-related careers [59]. Skill development goes beyond technical proficiency; it encompasses the cultivation of problem-solving abilities, critical thinking, and adaptability. The effectiveness of these interventions can be measured by examining the increased enrollment of girls in STEM programs, the retention rates within these programs, and subsequent career choices. Evaluating the success of mentorship programs involves tracking mentees' progress in STEM fields, while initiatives focusing on hands-on experiences should measure their impact on skill acquisition and confidence levels [60].

Moreover, the effectiveness of interventions should be gauged not only in terms of immediate outcomes but also in long-term career success. Tracking the professional trajectories of women who have benefited from these programs provides insights into the lasting impact on their skills, leadership capabilities, and contributions to the tech industry [63].

## 2.4 The Economic Benefit of Women Participation in Tech

According to Lee and Chung [64], increased female participation in tech fields yields substantial economic benefits. Diverse teams, including more women, bring a variety of perspectives and ideas, fostering innovation and problem-solving. Studies show that companies with gender-diverse teams outperform others, enhancing overall productivity and competitiveness [65,35,32]. Embracing gender diversity in tech is not just an ethical imperative but also a strategic move for sustained economic growth [32]. The economic advantages of gender diversity in technology manifest in the tangible impact on team dynamics and innovation. A multitude of perspectives stimulates creativity and encourages out-of-the-box thinking. Women, often bringing unique viewpoints and approaches, contribute to a richer pool of ideas within tech teams. This diversity in thought becomes a catalyst for innovation, enabling companies to develop solutions that are more comprehensive and adaptable to a variety of scenarios [66].

Numerous studies underscore the positive correlation between gender diversity and business performance [13,25,32,66]. Companies with gender-diverse teams consistently outperform their counterparts in terms of productivity and competitiveness. Research indicates that diverse teams are more adept at addressing complex challenges, fostering a culture of creativity and innovation that ultimately translates into tangible economic benefits[34,54,66]. This competitive edge positions businesses to navigate the rapidly evolving landscape of the tech industry with agility and resilience [40].

The positive correlation between gender diversity and financial performance is not confined to anecdotal evidence; it is backed by empirical studies [68,69]. McKinsey's report on diversity reveals a strong connection between gender diversity at the executive level and financial outperformance [67]. Embracing gender diversity in leadership positions correlates with enhanced profitability, showcasing the economic significance of diverse perspectives in decision-making processes. Beyond financial metrics, the advantages of increased female participation extend to overall organizational health [40]. A diverse workforce fosters a more inclusive and supportive culture, attracting top talent and contributing to employee satisfaction and retention [61,66]. In the competitive landscape of the technology sector, where the demand for skilled professionals is high, creating an inclusive environment becomes a strategic asset for attracting and retaining a diverse pool of talent.

Excluding women from tech limits innovation potential. A diverse workforce brings together a spectrum of skills and experiences, leading to more creative solutions. By fostering an inclusive environment, tech industries can tap into a broader talent pool, harnessing the full spectrum of capabilities that both men and women offer. This inclusivity not only drives innovation but also

positions companies for long-term success in the rapidly evolving tech landscape [61.62].

Efforts to increase female participation in tech should encompass various levels, from educational initiatives that encourage young girls to pursue STEM fields to workplace policies that foster an inclusive and supportive environment. Mentorship programs, leadership development initiatives, and transparent hiring practices can contribute to dismantling barriers that impede women's progress in tech [60,61]. Advocating for increased female participation in tech is not just a quest for equality; it is a strategic imperative for economic growth. Diverse teams, enriched by the inclusion of women, are better equipped to drive innovation, enhance productivity, and maintain competitiveness in the dynamic landscape of the tech industry. Embracing gender diversity is not only a moral obligation but a forward-thinking strategy that positions the tech sector for sustained success in an increasingly diverse and interconnected world [70,71].

## 3. METHODS

The respondents for the study were selected using simple random sampling to ensure each potential respondent had an equal chance of being included in the survey. This approach minimized sampling bias, providing a representative cross-section of female professionals in tech-related roles across various industries. Data was collected through a structured questionnaire developed based on a Likert scale. The questionnaire consisted of closed-ended questions designed to measure multiple factors related to the professional experiences of women in the tech industry, including perceived barriers, workplace culture, support systems, and personal advancement opportunities. The researchers recruited participants by identifying suitable candidates on LinkedIn who matched the criteria of being female professionals in tech-related roles. A total of 843 emails were sent, out of which 572 were returned with completed and valid responses, resulting in a response rate of approximately 67.9%. This response rate was sufficiently high to ensure that the survey results were robust and could support reliable multiple regression analysis. The responses from the questionnaire were analyzed using multiple regression analysis. This statistical technique was used to determine the strength and significance of the relationships between independent variables (such as discrimination, access to training, and company policies) and the dependent variable (level of participation in tech-driven fields). Multiple regression analysis was instrumental in testing the research hypotheses, providing insights into the factors that significantly impact women's participation and success in the technology sector.

## 4. RESULTS

The results from the multiple regression analysis conducted to test Hypothesis 1, which posited that women face more significant barriers than men in entering and advancing in the fields of Artificial Intelligence, Big Data, and Cloud Infrastructures due to existing societal and organizational biases, indicate several significant relationships. The type of organization had a positive coefficient of 0.25 and a beta value of 0.20, with a p-value less than 0.05 and an R value of 0.45. This suggests that the type of organization where the respondent is employed significantly affects the severity of barriers faced, with a moderate correlation strength, indicating that different organizational types might present varying levels of barriers to female professionals. Years of experience showed a negative coefficient of -0.15 and a beta value of -0.10, also with a p-value less than 0.05 and an R value of 0.35. This result implies that as women gain more experience, they perceive fewer barriers, albeit with a lower correlation strength compared to other factors. Level of education, however, did not show a statistically significant effect on the severity of barriers faced, as evidenced by a p-value greater than 0.05. The coefficient was -0.10 with a beta value of -0.05 and an R value of 0.20, suggesting a weak and non-significant relationship. The specific tech sector variable had a positive coefficient of 0.20 and a beta value of 0.15, with a p-value less than 0.01 and an R value of 0.50. This indicates a significant and moderately strong relationship, suggesting that the particular sector within the tech industry also plays a crucial role in the level of barriers experienced by women.

The results from the regression analysis to test Hypothesis 2, which proposed that education and training programs in AI, Big Data, and Cloud Infrastructures are not adequately tailored to encourage and support the inclusion of women, showed significant findings across all predictors. The type of training program had a substantial impact on the inclusivity of educational and training programs, with a high coefficient of 0.43 and a beta value of 0.36. The p-value was less

than 0.001, and the R-value was 0.62, indicating a strong and statistically significant relationship. This result suggests that the nature of the training programs substantially influences how inclusive they are perceived, with certain types possibly being more conducive to supporting women's inclusion in tech fields. The frequency of participation in these training programs also showed a positive and significant effect on their perceived inclusivity, with a coefficient of 0.28 and a beta value of 0.24. The corresponding p-value was less than 0.001, and the R-value was 0.53, suggesting a moderate to strong correlation. This indicates that more frequent engagement in training programs correlates with a greater perception of inclusivity. Similarly, the participants' education level was found to influence the inclusivity of training programs significantly. It had a coefficient of 0.26 and a beta value of 0.21, with a p-value less than 0.01 and an R-value of 0.47. This finding implies a moderate correlation, suggesting that higher education levels might be associated with a greater recognition or expectation of inclusivity in educational and training environments.

The regression analysis results for Hypothesis 3 posited that companies with diverse teams, including higher representation of women in AI, Big Data, and Cloud Infrastructure roles, demonstrate better innovation and performance and show significant outcomes for all examined predictors. Gender diversity in the team emerged as a strong predictor of better innovation and performance in companies. The coefficient for gender diversity was 0.37, with a beta value of 0.33, and the p-value was less than 0.001. This indicates a substantial and statistically significant relationship with an R-value of 0.58, highlighting that higher gender diversity within teams is strongly correlated with enhanced innovation and performance. Company size also showed a positive effect on innovation and performance, with a coefficient of 0.22 and a beta value of 0.19. The p-value was less than 0.05, and the R-value stood at 0.41. This suggests that larger companies tend to exhibit better innovation and performance, potentially due to more resources and capacity for diversity. Additionally, the role of the respondents within their companies was found to influence innovation and performance positively. The coefficient was 0.18, and the beta value was 0.16, with a p-value less than 0.05 and an R-value of 0.39. This outcome suggests a moderate correlation, indicating that the roles individuals occupy can also impact the perceived levels of innovation and performance in their organizations.

**Hypothesis 1. Women face more significant barriers than men in entering and advancing in the fields of Artificial Intelligence, Big Data, and Cloud Infrastructures due to existing societal and organizational biases**

| Predictor | Coefficient | Beta Value | p-Value | R Value |
|---|---|---|---|---|
| Type of Organization | 0.25 | 0.20 | <.05 | .45 |
| Years of Organization | -0.15 | -0.10 | <.05 | .35 |
| Level of Education | -0.10 | -0.05 | >.05 | 0.20 |
| Specific Tech Sector | 0.20 | 0.15 | <.01 | 0.50 |

**Hypothesis 2. Education and training programs in AI, Big Data, and Cloud Infrastructures are not adequately tailored to encourage and support the inclusion of women in these fields**

| Predictor | Coefficient | Beta Value | p-Value | R Value |
|---|---|---|---|---|
| Type of Training Program | 0.43 | 0.36 | <.001 | 0.62 |
| Frequency of Participation | 0.28 | 0.24 | <.001 | 0.53 |
| Level of Education | 0.26 | 0.21 | <.01 | 0.47 |

**Hypothesis 3. Companies with diverse teams, including higher representation of women in AI, Big Data, and Cloud Infrastructure roles, demonstrate better innovation and performance compared to less diverse counterparts**

| Predictor | Coefficient | Beta Value | p-Value | R-Value |
|---|---|---|---|---|
| Gender Diversity in Team | 0.37 | 0.33 | <.001 | 0.58 |
| Company size | 0.22 | 0.19 | <.05 | 0.41 |
| Role of the Respondents | 0.18 | 0.16 | <.05 | 0.39 |

**Hypothesis 4. Effective implementation of gender-inclusive policies and initiatives significantly increases the participation of women in AI, Big Data, and Cloud Infrastructure roles within organizations**

| Predictor | Coefficient | Beta Value | p-Value | R-Value |
|---|---|---|---|---|
| Gender-Inclusive Policies | 0.45 | 0.40 | <.001 | 0.62 |
| Duration of Policies | 0.25 | 0.22 | <.01 | 0.47 |
| Company Size | 0.15 | 0.13 | <.05 | 0.38 |

The regression analysis results for Hypothesis 4, which hypothesized that the effective implementation of gender-inclusive policies and initiatives significantly increases the participation of women in AI, Big Data, and Cloud Infrastructure roles within organizations, demonstrate positive and significant findings across all predictors. Gender-inclusive policies emerged as a strong predictor with a high coefficient of 0.45 and a beta value of 0.40, with the p-value being less than 0.001. This result, coupled with an R-value of 0.62, indicates a strong and statistically significant relationship. It suggests that the presence and effective implementation of gender-inclusive policies are highly correlated with increased participation of women in tech-driven roles. The duration of these policies also showed a significant impact on women's participation, with a coefficient of 0.25 and a beta value of 0.22. The p-value was less than 0.01, and the R-value was 0.47, indicating a moderate to strong relationship. This suggests that not only the presence of such policies but also their sustained implementation over time is crucial for increasing women's participation in these sectors. Company size was also positively correlated with the involvement of women, indicated by a coefficient of 0.15 and a beta value of 0.13, with a p-value less than 0.05 and an R-value of 0.38. Although the relationship is weaker compared to the other variables, it still suggests that larger companies, which likely have more resources and infrastructure to implement inclusive policies, see greater participation of women.

## 5. DISCUSSION

The results indicate that the type of organization and specific tech sector significantly influence the severity of barriers women face in tech, with p-values of less than 0.05 and less than 0.01, respectively. This supports earlier studies suggesting that organizational culture and sector-specific dynamics play crucial roles in either perpetuating or mitigating gender discrimination in tech environments [4][6]. In contrast, years of experience negatively correlated with perceived barriers, implying that as women accrue more experience, they may develop strategies to overcome or become less affected by such obstacles. This finding aligns with Mhlanga's observations about the accumulation of professional capital reducing the impact of gender biases [5].

Interestingly, the level of education did not significantly affect the severity of barriers faced, which contradicts common assumptions that higher educational attainment can mitigate discrimination. This lack of significance might indicate that organizational and sectoral biases are so entrenched that educational advancements alone are insufficient to overcome them, echoing the concerns raised by Davila Dos Santos et al. about the persistent underrepresentation and discrimination despite higher qualifications [38].

The findings from this hypothesis confirm that the type of training program and the frequency of participation significantly affect the inclusivity of educational environments, with strong statistical backing ($p < .001$ and $p < .001$, respectively). This underscores the importance of carefully designed training programs that are sensitive to the needs of women, supporting Gill et al.'s argument about the pivotal role of tailored educational approaches in fostering gender inclusivity [13]. Furthermore, the significant role of frequent participation suggests that regular engagement in training can enhance the perception of inclusivity, possibly by fostering a sense of community and ongoing support, as discussed by Thomson and Anderson [15]. The moderate correlation between higher levels of education and perceived inclusivity ($p < .01$) might indicate that as women attain higher education, they become more discerning of or demand higher standards in training inclusivity, which aligns with research suggesting that educated women are more likely to advocate for inclusive environments [39].

Results strongly supported the notion that gender diversity within teams is significantly correlated

with better innovation and performance ($p < .001$), reinforcing the broad consensus in the literature on the benefits of diverse teams [28][25]. This finding is crucial in highlighting the practical benefits of gender inclusivity, not only from a moral standpoint but also from a performance-oriented perspective. Company size and the role of the respondents also played significant roles, suggesting that larger companies with more structured roles tend to perform better in terms of innovation, possibly due to better resources and more formalized diversity policies [21]. This reinforces the idea that structural factors within organizations can significantly influence the extent to which the benefits of diversity are realized.

The strong correlations between the implementation of gender-inclusive policies, their duration, and the participation of women in tech roles ($p < .001$ and $p < .01$, respectively) emphasize the critical role of sustained and effective diversity policies. These findings are in line with the initiatives highlighted by USAID and other bodies advocating for long-term commitments to gender diversity as a means of closing the gender gap in tech [9]. The lesser but still significant impact of company size ($p < .05$) supports the notion that while larger companies are better equipped to implement effective policies, there is still room for smaller entities to make impactful changes. This aligns with the broader discourse on the necessity of scalability and adaptability of gender policies across different organizational sizes and structures.

## 6. CONCLUSION

The findings of the study affirm the significant impact of organizational type, specific tech sectors, gender-inclusive policies, and educational practices on the participation and advancement of women in technology roles. Organizational characteristics and the particular nature of the tech sector play pivotal roles in defining the landscape women navigate in the tech industry. Notably, the presence and effectiveness of gender-inclusive policies within companies are strongly correlated with increased participation of women, highlighting the crucial role of sustained policy efforts. Moreover, the study confirms the benefits of gender diversity, demonstrating that diverse teams are not only more innovative but also perform better, reinforcing the business case for gender inclusivity.

## 7. RECOMMENDATIONS

To advance gender diversity effectively, the following consolidated recommendations are proposed for stakeholders in the tech industry, educational institutions, and policymakers:

**1. Implement and Enhance Inclusive Practices:** organizations should adopt and continuously refine comprehensive gender-inclusive policies that encompass recruitment, retention, promotion, and training. This initiative should extend to educational programs, ensuring they are designed to be inclusive and supportive of women, with adjustments based on ongoing feedback and outcomes.

**2. Promote Diversity in Team Composition and Leadership:** efforts should be made to ensure diversity in hiring and team composition, with a focus on achieving a balance in gender and other dimensions of diversity. Promoting women into leadership positions and increasing the visibility of female role models should be a priority to inspire and empower other women in tech.

**3. Long-term Commitment and Evaluation of Diversity Initiatives:** a long-term commitment to diversity policies is crucial, with regular evaluations to measure effectiveness and make necessary adjustments. This approach ensures that the policies evolve with the industry and continue to meet their objectives effectively.

**4. Foster a Supportive Network through Mentorship and Sponsorship Programs:** develop and sustain mentorship and sponsorship programs that connect women with leaders and role models in the industry. These programs should aim to provide guidance, support, and opportunities for professional growth, helping to build a supportive community that enhances women's career trajectories in tech.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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