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Technology-Driven Economy: Policy Suggestions For Increasing Women's Involvement With Artificial Intelligence, Big Data, And Cloud Infrastructures

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Abstract
As technology becomes increasingly embedded in every sector of the economy, promoting gender equity in artificial intelligence (AI) and related fields presents an area that can be instrumental in shaping a more equitable digital future. The current study is conducted with the prime aim of reviewing the current standing of gender parity in AI, big data, and cloud infrastructures to inspect the challenges and propose policy suggestions for increasing women's involvement in these areas. The study is grounded upon a qualitative review design and data was collected using secondary sources to enable a comprehensive insight. The findings emerging from the thematic analysis of the body of research revealed that while there are clear benefits to increasing women's participation in AI, big data, and cloud infrastructures, significant challenges remain. Many women still face systemic barriers, such as lack of access to education, workplace discrimination, and limited networking opportunities. The widening digital divide between men and women in many regions, particularly in the Global South, remains a formidable challenge. Hence, the policy suggestions proposed in the current study are expected to direct initiatives in this paradigm by pinpointing the key facets calling for immediate policy interventions. To put it succinctly, the review indicates that while substantial progress has been made, continued efforts are necessary to create an equitable and inclusive technology ecosystem. The recommendations drawn from existing literature provide a roadmap for stakeholders to make the tech industry more accessible and diverse.

Keywords: Technology-Driven Economy, Policy Suggestions, Artificial Intelligence, Big Data, Cloud Infrastructures, Women in AI, Women in Tech.

1 Introduction

The integration of women into the technology-driven economy, particularly in fields such as Artificial Intelligence (AI), Big Data, and Cloud Infrastructures, has become increasingly instrumental in ensuring both gender equity and technological advancement (Ezeugwa et al., 2024). However, despite notable progress in gender parity across many industries, there remains a substantial underrepresentation of women in these technological domains (Samuel et al., 2020; Stathoulopoulos & Mateos-Garcia, 2019). The workforce in AI and related technologies is heavily male-dominated. A World Economic Forum report from 2024 highlights that while women make up 42% of the global workforce, they only constitute about 28.2% of STEM jobs, a field closely tied to AI, Big Data, and Cloud technologies. Additionally, women hold fewer leadership positions in these industries, with only 25% of C-suite roles occupied by women (Geldard, 2024). This disparity in leadership representation further compounds the difficulties women face in climbing the career ladder in technology fields (Ozkazanc-Pan, 2021). Besides, the gender disparity in AI and technology also stems from various structural and socio-cultural barriers (Roopaei et al., 2021). The existence of educational gaps is one of the underlying causes due to which only a small proportion of women pursue degrees in computer science, engineering, or data sciences. As per Geldard (2024), while women possess valuable soft skills relevant to future work environments, they remain underrepresented in critical hard skills like AI, programming, and Big Data. Without targeted interventions, these gaps are anticipated to further widen with the continual technological advances.

Such marginality in representation is not only detrimental to inclusivity but also poses significant limitations on innovation and the development of robust, diverse AI systems (Punia, 2023). As technology becomes increasingly embedded in every sector of the economy, promoting gender equity in AI and related fields will be instrumental in shaping a more equitable digital future (Zankova, 2021). Hence, addressing these gender gaps calls for robust policy interventions

at both the educational and organizational levels to yield extensive social and economic benefits. Consequently, the present study intends to carry out a comprehensive review in this regard focused on evaluating the existing body of research on increasing women's participation in Artificial Intelligence (AI), Big Data, and Cloud Infrastructures within the broader context of a technology-driven economy. The aim is to enlighten the persisting challenges and make policy suggestions that best capture the areas requiring further consideration in light of the current standing of the issue.

2 Methodology

2.1 Research Approach

The study is grounded upon a qualitative review design. The methodology adopted focused on comprehensively identifying, analyzing, and synthesizing relevant sources that explore the various challenges and opportunities related to gender diversity in these fields.

2.2 Literature Search and Data Collection

In order to gather relevant data from secondary sources, a comprehensive literature search was conducted to gather relevant academic articles, reports, and policy documents. Databases and search engines like Google Scholar, ScienceDirect, and PubMed were used, along with industry-specific resources from the World Economic Forum, UN reports, and related sites. A combination of distinct conjunctions of relevant topic-specific keywords was used for searching across the chosen sites. Some of the phrases/keywords used included "gender gap in AI", "women in Big Data", "gender diversity in technology", "cloud infrastructure workforce", "policy interventions for women in tech", "women in STEM education", and so forth.

2.3 Eligibility Criteria

To maintain focus on providing a comprehensive view of the current state of women's participation in technology-driven fields, a set of inclusion and exclusion criteria was applied to confine the extracted sources. Only those studies were included that were:

- Published in English.
- Focused on any related aspect of women's involvement in AI, big data, cloud infrastructure or any related field.
- Published between 2000-2024.
- Based on data regarding the discussion of gender diversity and gender parity in STEM fields related to these domains.

After applying the above criteria, all the sources extracted were used to gather info for the review, while studies that did not have any of the above-mentioned criteria were excluded from the review.

2.4 Thematic Analysis for Data Synthesis

The selected literature was analyzed using qualitative methods, focusing on thematic analysis to identify key trends, challenges, and opportunities related to women's participation in AI, big data, and cloud infrastructure. Thematic coding was used to categorize the data into specific themes to facilitate the allocation of information.

3 Results and Discussion

After reviewing the gathered sources, the themes emerging from the reviewed studies were grouped into interrelated sections to enable a clear understanding of the key facets found in the literature. The complexities and opportunities for increasing women's involvement in AI, Big Data, and cloud infrastructure were explored in detail and the resulting findings are thematically presented in the current section.

3.1 Gender Disparity in AI, Big Data, and Cloud Technology

Current statistics revealed a significant gender gap in the fields of AI and Big Data. According to the World Economic Forum, women represent only 26-30% of the workforce in AI-related roles (Gholizadeh, 2024; UN Women, 2024). This disparity is reflected across various levels of employment, from entry-level positions to leadership roles. The gender divide was also evident in educational pathways, where fewer women seem to pursue STEM (Science, Technology, Engineering, and Mathematics) degrees, leading to a smaller pipeline of qualified women entering these fields (Gholizadeh, 2024). Several factors contribute to this disparity, including cultural biases, lack of representation, and insufficient opportunities for mentorship and career development (Houser, 2019). Women often face implicit and explicit barriers in these industries, such as gender biases embedded in hiring practices and unequal access to networks that facilitate career advancement (UN Women, 2024). Moreover, the gender gap in digital literacy and internet access further limits the participation of women, particularly in low- and middle-income countries (UN Women, 2024).

3.1.1 Gender Disparities in STEM Fields

One of the most significant barriers to women's involvement in AI, Big Data, and Cloud technologies is the longstanding gender disparity in STEM fields. Globally, women represent only 35% of students enrolled in STEM disciplines, and they are more likely to face challenges such as gender-based harassment, which leads to higher dropout rates compared to men. According to the OECD, the gender gap in technology fields is widening in some regions, further compounding the issue (Caira et al., 2023; Trivedi et al., 2019). As per the data reported by Young (2021), women in some regions represent a minority in technology-related educational programs, though countries like Malaysia have made strides in

achieving near parity in certain tech disciplines. However, the global trend still reflects lower female participation in STEM education, particularly in AI and data science, thus limiting the pipeline of women entering these fields (Young et al., 2023).

To address this, many studies suggest that governments and educational institutions must invest in gender-sensitive policies that promote STEM education for girls at an early age (Sánchez-Tapia & Alam, 2020). The inclusion of mentorship programs and support networks, such as the Global Women's Network for the Energy Transition, has been shown to have a positive impact on female retention rates in STEM careers (Trivedi et al., 2019). Moreover, policies must ensure that women feel safe and supported within academic and workplace environments.

3.1.2 Workplace Environment and Gender Bias

Despite increased awareness of gender bias in technology sectors, studies continue to show that many women face an unwelcoming workplace environment. Gender stereotypes, unequal pay, and lack of access to leadership roles remain persistent issues. Women in AI and Big Data roles are significantly underrepresented, and often relegated to administrative positions rather than technical roles (Caira et al., 2023; Trivedi et al., 2019). For example, in the European Union's transport sector, women hold only 17.5% of jobs, mostly in customer service or administrative roles, rather than in technical fields (Wright, 2019). To address these disparities, companies and governments must implement robust diversity policies. Organizations such as Google and IBM have initiated internal programs to ensure more women are promoted into technical and leadership roles (González-González et al., 2018).

Institutional efforts to counter these biases include implementing mandatory diversity and inclusion policies across tech companies, ensuring fair hiring practices, and creating targeted programs to promote women into leadership positions. Companies like Google, IBM, and Microsoft have taken initiatives to increase the percentage of women in technical roles through internal mentorship and promotion opportunities (Trivedi et al., 2019).

3.2 Policy Interventions to Enhance Women's Participation

3.2.1 Education and Skill Development

One of the most critical steps to increasing women's involvement in AI, Big Data, and cloud technologies is improving access to education and skill development programs. Encouraging more girls and young women to pursue careers in STEM is essential to closing the gender gap. To enhance women's involvement in these fields, a multi-faceted policy approach is needed. This includes creating gender-sensitive education policies that encourage more women to enter technology-related fields from an early age (Petrucci, 2020).

Educational institutions, governments, and private organizations must collaborate to offer targeted programs, scholarships, and outreach initiatives that promote STEM careers among women, addressing both the educational and socio-cultural barriers they face. Additionally, re-skilling and up-skilling programs aimed at adult women can help those currently outside the tech workforce to enter these fields (UN Women, 2024). Some successful initiatives have already been launched in various countries. For instance, the African Girls Can Code Initiative and Girls Who Code provide coding boot camps and digital skills training specifically for young women (UN Women, 2024). These programs not only build technical competencies but also foster a sense of community among participants, helping them navigate the male-dominated tech environment more effectively.

3.2.2 Inclusive Workplace Policies

A significant barrier to women's advancement in AI, Big Data, and cloud infrastructures is the lack of inclusive workplace environments. Many organizations have historically failed to implement policies that promote diversity, equity, and inclusion (DEI) in meaningful ways. Gender bias in hiring, promotion practices, and decision-making processes aggravates the underrepresentation of women in leadership roles within the tech industry (Gholizadeh, 2024).

Inclusive work environments and workplace policies are essential for attracting and retaining women professionals in the tech workforce (Geldard, 2024; Young, 2021). These include flexible working arrangements, such as remote work and parental leave policies, which accommodate women's diverse needs (Ezeugwa et al., 2024). Furthermore, mentoring and sponsorship programs can provide women with the guidance and support necessary for career progression (Gholizadeh, 2024).

Implementing blind recruitment techniques and establishing diverse hiring panels can mitigate biases in the hiring process. Similarly, structured interviews with standardized questions can ensure that all candidates are evaluated fairly based on their qualifications rather than subjective impressions. These strategies have proven effective in reducing bias and increasing the number of women hired in tech-related roles (Gholizadeh, 2024).

3.2.3 Networking and Mentorship Opportunities

Networking plays a crucial role in career advancement, and women in AI and cloud computing often face challenges in accessing the same networks as their male counterparts. Creating formal mentorship and sponsorship programs can help women build the professional relationships needed to succeed in these industries. These programs can provide women with guidance on navigating career obstacles, developing leadership skills, and accessing growth opportunities (Gholizadeh, 2024).

While several countries have made strides in increasing women's participation, significant challenges remain. In the Global South, the digital divide between men and women is substantial, making it harder for women to access technology

and training and make progressions in big tech fields (Ezeugwa et al., 2024; Ibon International, 2023). Research shows that without concerted efforts to close this divide, women in developing countries will continue to be left behind in the tech-driven economy (Marchant, 2021). Hence, encouraging the formation of women's resource groups and fostering online platforms where women in AI and tech can connect, share resources, and discuss career development strategies is also a valuable step toward addressing the gender gap. Such platforms offer women a space to exchange knowledge, build support networks, and collectively advocate for better opportunities (Gholizadeh, 2024).

3.2.4 Government and Corporate Policy Recommendations

Governments and private corporations have a pivotal role to play in ensuring that women are not left behind in the rapidly growing AI and Big Data sectors. Policymakers must prioritize gender inclusivity in technology sectors by implementing policies that address the structural barriers women face. For instance, government-backed initiatives that incentivize organizations to hire more women in STEM roles through tax benefits or public recognition can be effective (UN Women, 2024). Moreover, public policies that promote digital literacy and expand internet access, especially in underserved regions, can enable more women to participate in the digital economy. Programs that reduce the digital divide can empower women to access online educational resources, professional development opportunities, and remote work options (UN Women, 2024). Similarly, corporate policies should focus on gender diversity by setting clear targets for female representation in AI, Big Data, and cloud computing roles.

3.2.5 Addressing Gender Bias in AI

One of the most insidious barriers to women's inclusion in AI is the presence of gender bias within AI systems themselves. AI models trained on biased datasets often perpetuate harmful stereotypes, leading to discrimination in areas such as hiring, healthcare, and credit assessments. Addressing gender bias in AI requires a multi-pronged approach, including diversifying the teams that build AI systems and ensuring that the data used to train AI is representative of all genders (UN Women, 2024). Thus, it can be asserted that for creating AI systems that serve everyone equitably, it is essential to have women involved in the design, development, and deployment of these technologies. Policies that promote the inclusion of gender and racial perspectives in AI development teams can help ensure that AI systems reflect diverse experiences and mitigate bias (Gholizadeh, 2024). There is also a growing recognition that policies must focus on leadership pathways. Ensuring that women are well-represented in decision-making roles is crucial for fostering inclusive workplace environments that champion diversity. Research suggests that greater diversity at the leadership level can contribute to the development of more ethical and socially responsible AI systems. Additionally, promoting research and awareness about the ethical implications of AI and Big Data is crucial for developing technologies that do not worsen the existing social inequalities.

3.2.6 Economic and Social Benefits of Women's Inclusion

Increasing women's participation in AI, Big Data, and Cloud Infrastructures has significant economic benefits. Studies by McKinsey show that closing the gender gap in the workforce could add as much as $28 trillion to the global GDP by 2025 (Trivedi et al., 2019). Moreover, companies with higher gender diversity, especially in leadership roles, show greater financial returns. Data indicates that diverse teams bring fresh perspectives, which leads to innovation and better decision-making in AI and Big Data projects (Caira et al., 2023). Beyond economic growth, the social benefits of increasing women's participation in these fields are also substantial. Inclusion in the workforce can enhance women's status in society, allowing them to contribute more actively to community development and environmental sustainability efforts. Research shows that businesses led by women are more likely to prioritize energy efficiency, invest in renewable resources, and advocate for corporate social responsibility (Trivedi et al., 2019).

3.2.7 Case Studies: Successful Implementation of Gender-Inclusive Policies

Several countries and organizations have demonstrated success in increasing women's participation in technology fields. For instance, Canada has pioneered programs aimed at increasing women's participation in AI through investment in gender-inclusive research projects and tech hubs that encourage women entrepreneurs (Caira et al., 2023). Public-private collaborations in Canada also emphasize gender-inclusive technology ecosystems (Rowe, 2016). Pre-apprenticeship programs and public-private partnerships have emerged as effective ways to help women break into technical fields (International Telecommunication Union, 2021; Young, 2021). For example, countries like the U.S. have adopted pre-apprenticeship models that target women in underrepresented sectors (Geldard, 2024). Similarly, initiatives like "Girls Who Code" in the United States focus on increasing the number of women in technical roles by providing early exposure to coding and tech careers (Caira et al., 2023; Trivedi et al., 2019).

In developing countries, efforts like the UN's solar panel training program in Tanzania have not only economically empowered women but also elevated their roles in environmental decision-making (Gholizadeh, 2024; Trivedi et al., 2019). Additionally, companies with gender-diverse teams show better financial returns, particularly in sectors related to AI and Big Data (International Telecommunication Union, 2024). Research has also corroborated that diverse teams in tech lead to more innovation and better decision-making (Ramos, 2022; UN Women, 2024). These examples underscore the importance of targeted training programs, mentorship, and community support in fostering women's leadership in tech-driven sectors. Overall, the current findings have illuminated the need for a concerted, multi-faceted approach to gender inclusion in technology sectors. Policymakers must remain committed to making the tech sector more accessible

to women by ensuring that diversity and inclusion are not merely aspirations but realities that are implemented across industries (Caira et al., 2023; Trivedi et al., 2019; UN Women, 2024). Thus, it can be concluded that through ongoing collaboration between governments, industries, and educational institutions, significant progress can be made toward gender parity in AI, Big Data, and Cloud Infrastructures (Ezeugwa et al., 2024; Trivedi et al., 2019).

4 Conclusion

In drawing things to a close, from the above insights it can be asserted that increasing women's involvement in AI, Big Data, and cloud infrastructures is not only a matter of equity but also a critical economic and social imperative. As the digital economy continues to grow, ensuring that women are fully included in the workforce will enhance innovation, drive economic growth, and lead to more inclusive technological advancements. The present overview of the existing evidence in this paradigm stresses the need for comprehensive policies that address the educational, workplace, and societal barriers preventing women from entering and thriving in these fields. Therefore, policymakers and industry leaders can help close the gender gap and create a more diverse and equitable tech industry by attempting to foster inclusive work environments, promote gender-responsive AI development, and offer more opportunities for women in STEM education and career advancement. By promoting inclusive hiring practices, supporting women's leadership in tech, and ensuring gender-sensitive educational frameworks, governments and industries can work together to close the gender gap and foster a more diverse, innovative, and equitable technological future.

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