

Gender Gap in Pakistan's IT Industry: Implications for National Security of Pakistan

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Abstract

The IT industry is a critical driver of economic growth and innovation globally, yet significant gender disparities persist, particularly in Pakistan. This study examines the underrepresentation of women in Pakistan's IT sector, exploring its implications for national security. The problem is rooted in cultural norms, educational disparities, and workplace discrimination, which collectively hinder women's participation and advancement in this field. The research employs the Human Security Approach as a conceptual framework, emphasizing the need for inclusive and participatory processes that prioritize the safety and well-being of individuals over traditional state-centric views of security. The central research question addresses how gender inequality in Pakistan's IT industry impacts national security, particularly concerning human security dimensions. The major argument theorizes that gender inequality in the IT sector can lead to significant human security challenges and broader national security implications for Pakistan. Utilizing a qualitative methodology, the study draws on secondary data sources, including books, reports, journal articles, and newspaper articles. The findings highlight the complex interplay between gender disparities in IT and national security concerns, underscoring the need for targeted strategies to promote gender equality and enhance the country's security posture.

Keywords: Gender Inequality, IT Industry, Pakistan, Human Security, National Security

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Introduction

In recent years, the IT industry has emerged as a pivotal sector for economic growth and innovation globally.² However, gender inequality within this industry remains a significant issue, particularly in Pakistan, where it has far-reaching implications for both social equity and national security.³ Despite the crucial role of women in fostering innovation and economic development, they are significantly underrepresented in Pakistan's IT sector.⁴

This gender gap not only perpetuates economic and social disparities but also poses a threat to the country's technological and security posture.⁵ The underrepresentation of women in IT affects their economic security, personal and community safety, and overall participation in the workforce, which are critical components of human security.⁶ Moreover, it limits the diversity of perspectives necessary for addressing complex cybersecurity threats and developing inclusive technological solutions.⁷

Existing literature highlights the critical impact of gender disparities in various sectors, including IT, on social and economic outcomes. Gorbacheva et al. emphasize the need for comprehensive research to address gender imbalances in the IT profession and enhance diversity efforts.⁸ They identify critical gaps in current understanding that impede the development of effective strategies to address these issues.⁹ Similarly, Yamamoto and Frachtenberg find that gender differences in collaboration patterns in computer science exacerbate the gender gap, particularly in fields with fewer female authors, which shows lower female productivity.¹⁰

² Dr. Bhawna Yadav, *Role-of-Information-Technology-and-Its-Perspectives-in-Research-and-Development-of-Economy*, 2021.

³ UN Women, "Women, Peace and Security and Humanitarian Action," Unofficial Website, UN Women – Asia-Pacific, October 23, 2023.

⁴ Dilaira Dubash, "Cracking the Code: Pakistan's Tech Frontier Needs More Women Pioneers," Breccorder, accessed July 31, 2024, <https://www.brecorder.com/news/40250098>.

⁵ Ibid., 15.

⁶ "Bridging the Gender Gap: Women in Pakistan's Evolving Tech Sector | Anankemag," October 10, 2023.

⁷ Ibid., 12.

⁸ Elena Gorbacheva et al., "Directions for Research on Gender Imbalance in the IT Profession," *European Journal of Information Systems* 28, no. 1 (January 2, 2019): 43–67.

⁹ Ibid., 23.

¹⁰ Josh Yamamoto and Eitan Frachtenberg, "Gender Differences in Collaboration Patterns in Computer Science," *Publications* 10, no. 1 (February 24, 2022): 10.

Abazi-Bexheti et al. report a persistent underrepresentation of women in computer science research, identifying educational and career barriers as key contributors to gender gap.¹¹ Wynarczyk and Renner examine the gender gap in UK science and technology SMEs, finding significant barriers to women's career progression and participation in Research and Development (R&D) roles, which limit women's opportunities and hinder their advancement in these fields.¹² McMillan explores gender differences in patenting activity in the US biotechnology sector, noting that structural factors limit women's patenting activity compared to men.¹³ Together, these studies highlight the complex and multifaceted nature of gender disparities in Science, Technology, Engineering, and Mathematics (STEM) fields, underscoring the need for targeted strategies to foster greater inclusivity and equality.

Despite these insights, there is a notable gap in research focusing specifically on the gender gap in Pakistan's IT industry and its implications for national security. This study aims to fill this gap by exploring how gender inequality in Pakistan's IT sector impacts both human security and national security. The primary research question guiding this study is: "How does gender inequality in Pakistan's IT industry impact national security, particularly concerning human security dimensions?" The central argument posits that gender inequality in the IT sector can create significant human security challenges and broader national security implications for Pakistan. Addressing these disparities is essential not only for social equity but also for enhancing the country's resilience and security.

The study employs a qualitative research methodology, utilizing secondary data sources, including books, reports, journal articles, and newspaper articles. This approach allows for a comprehensive analysis of the existing literature, policy documents, and empirical data to understand the scope and impact of gender inequality in the IT industry on national security.

The organization of the study includes a literature review, a discussion of the conceptual framework focusing on the Human Security Approach, an analysis of gender gaps and their

¹¹ L. Abazi-Bexheti, A. Kadriu, and M. Apostolova, "Investigating Gender Gap in Computer Science Research Community," *42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, May 2019, 737–41.

¹² Pooran Wynarczyk and Chloe Renner, "The 'Gender Gap' in the Scientific Labour Market: The Case of Science, Engineering and Technology-based SMEs in the UK," ed. Pooran Wynarczyk, *Equal Opportunities International* 25, no. 8 (December 1, 2006): 660–73, <https://doi.org/10.1108/02610150610719128>.

¹³ G. Steven McMillan, "Gender Differences in Patenting Activity: An Examination of the US Biotechnology Industry," *Scientometrics* 80, no. 3 (September 2009): 683–91.

underlying causes in Pakistan's IT industry, and an exploration of the implications of these gaps on human security and national security.

Conceptual Framework

The human security concept expands the traditional security approach by including the security of individuals living within a state's borders in the security narrative. For instance, the concept of human security includes threats such as economic insecurity, health insecurity, food insecurity, environmental insecurity and violence against people. The concept of human security rests on fundamental idea of ensuring freedom from want and fear. It ensures that individuals feel protected and safe within the geographical boundaries of a state. Furthermore, according to the concept of human security, threat faced by the individuals are interconnected. For example, economic security, food security, and health security are linked with each other. This approach emphasizes on adopting the proactive approach and ensuring human security through addressing the basic problems.¹⁴

It is grounded in a rights-based perspective, asserting that true security involves safeguarding human rights and promoting social justice.¹⁵ Moreover, it emphasizes the importance of inclusive and participatory processes, involving diverse stakeholders, including governments, international organizations, civil society, and affected communities, in crafting policies that are responsive to the needs and conditions of individuals.¹⁶ This comprehensive and holistic perspective seeks to create a secure and equitable environment where all people can live with dignity and peace.

Gender Inequality and National Security of Pakistan

Gender Inequality in the IT industry has significant implications for National Security of Pakistan, particularly when viewed through the lens of the Human Security Approach.¹⁷ This perspective emphasizes that the security extends beyond mere territorial defense and includes the

¹⁴ Ibid., 15.

¹⁵ Sudha Menon, "Human Security: Concept and Practice," *University Library of Munich, Germany, MPRA Paper*, March 31, 2007.

¹⁶ Ibid., 25.

¹⁷ "Gender and Human Security in Post-Conflict Pakistan: Policy Implications of Local, Gendered Perceptions of Security and Development - Prosjektbanken," Prosjektbanken - Forskningsrådet, accessed March 31, 2024, <https://prosjektbanken.forskningsradet.no/project/FORISS/203913>.

well-being and dignity of individuals.¹⁸ In Pakistan, the underrepresentation and marginalization of women in the IT sector not only perpetuates social and economic disparities but also weakens the country's overall technological and security posture.¹⁹

A diverse workforce in critical sectors like IT is essential for fostering innovation and enhancing cybersecurity, a crucial component of national security.²⁰ When women are excluded from this field, the industry loses valuable perspectives and potential, undermining its ability to develop comprehensive solutions to emerging cyber threats.²¹ Moreover, gender inequality in IT can exacerbate broader social tensions and contribute to economic instability, both of which can have destabilizing effects on national security.²² Therefore, addressing gender inequality in the IT industry is not just a matter of social justice; but also a strategic imperative for enhancing Pakistan's national security and resilience.

Gender Inequality in Pakistan's IT Industry

The Global Gender Gap Report 2021 positions Pakistan at 153rd out of 156 countries, highlighting significant gender disparities.²³ Although women constitute 49.2% of the country's population, they represent only 22.2% of the labor force.²⁴ Within the IT industry, the Pakistan Software Houses Association Salary Survey 2021 reveals a gender diversity ratio of just 17.08%.²⁵ Further exacerbating these disparities, IMF research indicates that women over 40 are at a significantly higher risk of job displacement compared to their male counterparts in the same age group.²⁶ This phenomenon not only impacts women and their families adversely but also detracts from the broader economic potential and productivity of companies and the economy as a whole.

¹⁸ Ibid., 14.

¹⁹ Dubash, "Cracking the Code."

²⁰ Ankita Saxena, "Workforce Diversity: A Key to Improve Productivity," *Procedia Economics and Finance*, Shaping the Future of Business and Society, 11 (January 1, 2014): 76–85.

²¹ Ibid., 12.

²² Ibid., 13.

²³ "Global Gender Gap Report 2021," *World Economic Forum*, accessed March 24, 2024, <https://www.weforum.org/publications/global-gender-gap-report-2021/in-full/gggr2-benchmarking-gender-gaps-findings-from-the-global-gender-gap-index-2021/>.

²⁴ "What Prevents Women's Labour Force Participation in Pakistan?" International Growth Centre, March 11, 2024.

²⁵ "P@SHA Diversity & Inclusion: IT & ITeS Landscape," *P@SHA* (blog), accessed May 30, 2024, <https://www.pasha.org.pk/publications/psha-diversity-inclusion-it-ites-landscape/>.

²⁶ Ibid., 12

In the IT industry, the gender diversity ratio exhibits an inverse relationship with hierarchical progression, showing a declining trend as roles advance in seniority. At the mid-level, the gender diversity ratio is approximately 32%, which falls within the medium range of 30% to 50%.²⁷

Gender Gap Data in Pakistan's IT Sector

Category	Details
Global Gender Gap Report 2021 Rank	153 rd out of 156 countries
Female Population Percentage	49.2%
Female Labor Force Participation	22.2%
Gender Diversity Ratio in IT Industry	17.08%
Female Board Members in Tech Companies	11 out of 100 directors, 3 companies with no female representation
Women-led Startups Funding (Year 1)	\$9.8 million (1.12% of total funding)
Women-led Startups Funding (Year 2)	0.88% of total funding

Data compiled by the author from World Economic Forum, Global Gender Gap Report 2021; United Nations, World Population Prospects 2021; McKinsey & Company, Women in the Workplace 2021; Dawn Newspaper, "P@SHA Diversity & Inclusion: IT & ITeS Landscape"; and PitchBook, Annual VC Report 2021.

Although detailed data by levels of seniority is not provided, evidence suggests that this ratio decreases at higher levels of leadership.²⁸ An examination of the board of directors across 13 tech companies listed on Pakistan Stock Exchange reveals that out of 100 directors, only 11 are women, with three companies having no female representation at all.²⁹

The situation appears to be even more pronounced in private markets, where there are no guidelines from the Securities and Exchange Commission mandating female representation on

²⁷ Ibid., 11

²⁸ Sara Danial, "Addressing the Digital Gender Gap," *Dawn*, March 20, 2024, <https://www.dawn.com/news/1834554>.

²⁹ Ibid., 10.

boards.³⁰ In instances where women are present as directors or co-founders, the roles are often limited by nepotistic practices, with female board members frequently being family members of male executives.³¹

Furthermore, there are cases where women are designated as co-founders in startups without significant equity or decision-making power, a practice that sometimes serves to enhance public image or fulfill criteria for gender-focused grants.³² This disparity in gender representation highlights a significant challenge in achieving true gender equality and leveraging the full potential of the workforce in Pakistan's IT sector.³³

In Pakistan's tech industry, women face significant challenges, as evidenced by the disproportionate allocation of funding, with women-led startups receiving only \$9.8 million, or 1.12 percent of total funding, which further decreased to 0.88 percent in the following year.³⁴ This underrepresentation is influenced by several factors.³⁵ Cultural norms and societal expectations often prioritize traditional roles for women, such as homemaking, discouraging them from pursuing careers in technology.³⁶

Educational disparities also persist, with girls facing obstacles in accessing quality STEM education, limiting their opportunities in the tech sector.³⁷ Within workplaces, gender bias and discrimination are prevalent, resulting in unequal pay, limited leadership roles, and biased hiring and promotion practices.³⁸ The lack of supportive policies and an inclusive work environment exacerbates these issues.

³⁰ Ibid., 12.

³¹ Ibid., 24.

³² "Helping Scale Pakistani High-Growth Women Entrepreneurs," *Women Entrepreneurs Finance Initiative* (blog), April 26, 2021.

³³ Ibid., 5.

³⁴ Wara Irfan, "Yes to More Women in Tech!" *Dawn*, 2023, <https://www.dawn.com/news/1760063>.

³⁵ Ibid., 7.

³⁶ Aneela Firdoos, Farah Latif Naz, and Zuha Masud, "Impact of Cultural Norms and Social Expectations for Shaping Gender Disparities in Educational Attainment in Pakistan," *Qlantic Journal of Social Sciences and Humanities* 4 (September 30, 2023): 166–72, <https://doi.org/10.55737/qjssh.311246563>.

³⁷ Elizaveta Tereshchenko, Ari Happonen, and Victoria Hasheela, "Barriers for Females to Pursue Stem Careers and Studies at Higher Education Institutions (HEI). A Closer Look at Academic Literature," *International Journal of Computer Science & Engineering Survey* 14 (July 22, 2023): 1–22, <https://doi.org/10.5121/ijcses.2023.14401>.

³⁸ Ibid., 32.

Moreover, balancing work and family responsibilities is a significant challenge for women, often leading to burnout and hindering career advancement.³⁹ Women entrepreneurs face further barriers in securing funding and resources, as investors tend to be reluctant to support women-led ventures.⁴⁰ Online harassment and safety concerns also create a hostile environment for women working in digital spaces.

Impact of Gender Inequality in the IT Industry on Human Security in Pakistan

Gender inequality in the IT industry has far-reaching implications for human security in Pakistan.⁴¹ Human security, as defined by the United Nations, encompasses the protection of individuals from critical and pervasive threats, highlighting the importance of economic, food, health, environmental, personal, community, and political security.⁴² When examining the underrepresentation of women in Pakistan's IT sector, it becomes clear that this inequality poses significant challenges to multiple dimensions of human security.⁴³

▪ Economic Security

The IT industry is a crucial driver of economic growth and innovation.⁴⁴ However, the limited participation of women in this sector restricts their access to well-paying jobs and economic opportunities.⁴⁵ This disparity contributes to a broader pattern of economic inequality, which can have destabilizing effects on families and communities.⁴⁶ Women's economic security is further

³⁹ Dr Elegbede and Moruf Abidogun, "Women's Experience of Balancing Work and Family Roles: Counselling Strategies for Promoting Work-Life Balance," 2023.

⁴⁰ Claire Leitch, Friederike Welter, and Colette Henry, "Women Entrepreneurs' Financing Revisited: Taking Stock and Looking Forward: New Perspectives on Women Entrepreneurs and Finance (Special Issue)," *Venture Capital* 20, no. 2 (April 3, 2018): 103–14, <https://doi.org/10.1080/13691066.2018.1418624>.

⁴¹ M. Sheharyar Khan and Iffat Pervaz, "Pakistan's Human Security Report 2024," June 8, 2024.

⁴² Luke Johns, "A Critical Evaluation of the Concept of Human Security," *E-International Relations* (blog), July 5, 2014.

⁴³ Khan and Pervaz, "Pakistan's Human Security Report 2024, p. 12.

⁴⁴ James Broughel and Adam Thierer, "Technological Innovation and Economic Growth: A Brief Report on the Evidence," *SSRN Electronic Journal*, February 1, 2019, <https://doi.org/10.2139/ssrn.3346495>.

⁴⁵ Gayle Tzemach Lemmon and Rachel Vogelstein, "Barriers to Women's Economic Participation," *Building Inclusive Economies* (Council on Foreign Relations, 2017), <https://www.jstor.org/stable/resrep29884.6>.

⁴⁶ Thomas A. DiPrete and Brittany N. Fox-Williams, "The Relevance of Inequality Research in Sociology for Inequality Reduction," *Socius* 7 (January 1, 2021): 23.

compromised when they are excluded from high-growth sectors like IT, which are pivotal in shaping the future job market.⁴⁷

In Pakistan, where a significant portion of the population relies on single-income households,⁴⁸ the lack of economic opportunities for women in the IT industry exacerbates poverty and limits the overall economic potential of the country.⁴⁹ The gender wage gap in this sector further entrenches economic disparities, affecting the quality of life for women and their families.⁵⁰ Economic security is a cornerstone of human security, and without equitable access to economic resources, the broader societal well-being is at risk.⁵¹

▪ ***Personal and Community Security***

The exclusion of women from the IT industry also affects their personal security and the security of their communities.⁵² In many parts of Pakistan, traditional gender roles and societal expectations limit women's participation in the workforce, particularly in fields like technology that are perceived as male-dominated.⁵³ This societal marginalization not only reduces women's agency and autonomy but also limits their ability to contribute to community development.⁵⁴ Personal security encompasses protection from violence, exploitation, and discrimination, all of which are exacerbated by gender inequality.⁵⁵ Women in the IT industry, like other sectors, face various forms of workplace harassment and discrimination, which can lead to psychological

⁴⁷ Sirianne Dahlum, Carl Henrik Knutsen, and Valeriya Mechkova, "Women's Political Empowerment and Economic Growth," *World Development* 156 (August 1, 2022): 105.

⁴⁸ Maria Aslam et al., "Assessing the Household Saving Behavior of Urban and Rural Households in Pakistan: Evidence from PSLM/HIES 2018-19," *Pakistan Journal of Humanities and Social Sciences* 10 (December 31, 2022): 2018-19, <https://doi.org/10.52131/pjhss.2022.1004.0299>.

⁴⁹ Azhar Iqbal Malik and Naeem Akram, "Determinants of the Gender Wage Gap in Pakistan," *SN Business & Economics* 4, no. 2 (January 30, 2024): 26.

⁵⁰ Ibid., 12.

⁵¹ Bernhard Reinsberg, Daniel O Shaw, and Louis Bujnoch, "Revisiting the Security-Development Nexus: Human Security and the Effects of IMF Adjustment Programmes," *Conflict Management and Peace Science* 41, no. 1 (January 1, 2024): 72-95, <https://doi.org/10.1177/07388942221111064>.

⁵² Mohammad Paydar, Asal Kamani-Fard, and Roya Etminani-Ghasrodashti, "Perceived Security of Women in Relation to Their Path Choice toward Sustainable Neighborhood in Santiago, Chile," *Cities* 60 (February 1, 2017): 289-300.

⁵³ Tazeen S. Ali et al., "Gender Roles and Their Influence on Life Prospects for Women in Urban Karachi, Pakistan: A Qualitative Study," *Global Health Action* 4 (November 2, 2011): 10.

⁵⁴ Elizabeth Bryan et al., "Addressing Gender Inequalities and Strengthening Women's Agency to Create More Climate-Resilient and Sustainable Food Systems," *Global Food Security* 40 (March 1, 2024): 10.

⁵⁵ Julie L. Arostegui, "Gender and the Security Sector: Towards a More Secure Future," *Connections* 14, no. 3 (2015): 7-30.

stress, diminished job satisfaction, and higher turnover rates.⁵⁶ These factors not only affect the well-being of the women involved but also signal to the broader society that women are not valued equally, perpetuating a cycle of exclusion and marginalization.⁵⁷

▪ ***Educational and Skill Development***

Access to education and skill development is a critical component of human security, enabling individuals to pursue meaningful and productive lives.⁵⁸ In the context of the IT industry, education in STEM fields is essential.⁵⁹ However, gender disparities in educational attainment and opportunities in Pakistan mean that fewer women are entering and advancing in the IT sector.⁶⁰ This educational gap has long-term implications for human security.⁶¹ As technology continues to shape the future of work, those without the necessary skills and education will be left behind, leading to greater economic and social inequality.⁶² For women, this means not only missing out on economic opportunities but also being excluded from the innovation and leadership roles that define the future trajectory of industries and economies.⁶³

▪ ***Health Security***

Health security, another dimension of human security, is also impacted by gender inequality in the IT industry.⁶⁴ Economic insecurity, workplace discrimination, and stress associated with gender-based exclusion can have detrimental effects on mental and physical health.⁶⁵ Women who experience these challenges are more likely to suffer from mental health issues such as

⁵⁶ Javeria Kayani et al., “Problems of Working Women in Islamabad: A Case of Four Public Organizations,” *Journal of Policy Research* 9 (May 25, 2023): 606–14, <https://doi.org/10.61506/02.00025>.

⁵⁷ Etienne Lwamba et al., “Strengthening Women’s Empowerment and Gender Equality in Fragile Contexts towards Peaceful and Inclusive Societies: A Systematic Review and Meta-analysis,” *Campbell Systematic Reviews* 18, no. 1 (March 8, 2022): e1214, <https://doi.org/10.1002/cl2.1214>.

⁵⁸ Jon-Hans Coetzer et al., “Enhancing Human Security by Transforming Education Through Science, Technology, and Innovations,” March 7, 2023, 7–20.

⁵⁹ Rizky Nurul Hafni et al., “The Importance of Science, Technology, Engineering, and Mathematics (STEM) Education to Enhance Students’ Critical Thinking Skill in Facing the Industry 4.0,” *Journal of Physics: Conference Series* 1521 (March 1, 2020): 042040, <https://doi.org/10.1088/1742-6596/1521/4/042040>.

⁶⁰ Humaira Kamal Pasha, “Gender Differences in Education: Are Girls Neglected in Pakistani Society?” *Journal of the Knowledge Economy*, March 22, 2023, 1–46.

⁶¹ Coetzer et al., “Enhancing Human Security by Transforming Education Through Science, Technology, and Innovations.”

⁶² Oluwaseun Kolade and Adebawale Owoseni, “Employment 5.0: The Work of the Future and the Future of Work,” *Technology in Society* 71 (November 1, 2022): 102086, <https://doi.org/10.1016/j.techsoc.2022.102086>.

⁶³ Ibid., 15.

⁶⁴ Rebecca J. Cook, “Human Rights Dimensions of Health Security,” *Proceedings of the Annual Meeting (American Society of International Law)* 97 (2003): 101–6.

⁶⁵ Lasse Brandt et al., “The Effects of Social Isolation Stress and Discrimination on Mental Health,” *Translational Psychiatry* 12 (September 21, 2022): 398.

anxiety and depression,⁶⁶ which can be exacerbated by a lack of support systems both at work and in the broader society. Moreover, the stress and pressures associated with being underrepresented in a high-stress industry like IT can lead to burnout, impacting overall health and productivity.⁶⁷ The lack of gender-sensitive health and wellness programs in workplaces can further exacerbate these issues, leaving women without adequate support to manage their health.⁶⁸

▪ ***Political and Social Security***

Gender inequality in the IT industry has broader implications for political and social security.⁶⁹ The underrepresentation of women in this sector means they have less influence over the technological and digital policies that shape modern governance and societal norms.⁷⁰ This lack of representation can result in policies that do not fully address the needs and rights of women, perpetuating gender biases and inequalities.⁷¹ Furthermore, the exclusion of women from leadership roles in the IT industry limits their ability to advocate for gender-sensitive policies and practices within and beyond the sector.⁷² This exclusion from decision-making processes is a significant barrier to achieving social justice and equity, which are foundational to human security.⁷³

▪ ***Community and National Development***

The participation of female workforce in the IT industry is crucial role in community and national development. Owing to their distinct experience, they can identify unique aspects of problem may not be apparent to male dominated workforce, thereby driving innovation and

⁶⁶ Ibid., 19.

⁶⁷ Wizdom Powell Hammond, Marion Gillen, and Irene H. Yen, "Workplace Discrimination and Depressive Symptoms: A Study of Multi-Ethnic Hospital Employees," *Race and Social Problems* 2, no. 1 (March 1, 2010): 19–30.

⁶⁸ Whitney Fry et al., "Improving Women's Opportunities to Succeed in the Workplace: Addressing Workplace Policies in Support of Menstrual Health and Hygiene in Two Kenyan Factories," *Sustainability* 14, no. 8 (January 2022): 4521, <https://doi.org/10.3390/su14084521>.

⁶⁹ Christina Sanchita Shah and Satish Krishnan, "ICT, Gender Inequality, and Income Inequality: A Panel Data Analysis Across Countries," *Information Systems Frontiers* 26, no. 2 (April 1, 2024): 709–27.

⁷⁰ Eileen Trauth, Jeria Quesenberry, and Allison Morgan, "Understanding the under Representation of Women in IT: Toward a Theory of Individual Differences," *Conference Proceedings* 2004, 114–19, <https://doi.org/10.1145/982372.982400>.

⁷¹ Paola Profeta, ed., "How Women Affect Public Policy," *Gender Equality and Public Policy: Measuring Progress in Europe* (Cambridge: Cambridge University Press, 2020), 58–82.

⁷² Thelma Chanda and Loveness Ngulube, "Women in Leadership: Examining Barriers to Women's Advancement in Leadership Positions," *Asian Journal of Advanced Research and Reports* 18 (May 15, 2024): 273–90.

⁷³ Ibid., 23.

contributing in developing products that cater the diverse group.⁷⁴ A lower representation of women in the IT industry reduces diversity, which hampers the ability to find diverse solutions.⁷⁵ It also hinders the growth of a vibrant and inclusive digital economy, which is essential for sustainable national development.⁷⁶ Gender equality in the IT industry is thus not only a matter of justice but also a strategic imperative for fostering a resilient and inclusive society.⁷⁷

Implications of Gender Inequality in IT Industry for National Security of Pakistan

Gender inequality in the IT industry extends beyond societal and economic challenges; it has profound implications for the national security of Pakistan. The concept of national security in modern states encompasses not only traditional defense mechanisms but also the economic, technological, and societal dimensions that contribute to a nation's resilience and stability. In this context, the underrepresentation of women in Pakistan's IT sector is a critical issue that affects various aspects of national security.

▪ Cybersecurity Vulnerabilities

One of the most immediate national security concerns arising from gender inequality in the IT industry is the potential vulnerability in cybersecurity.⁷⁸ The IT sector plays a pivotal role in safeguarding national infrastructure, financial systems, and sensitive data from cyber threats.⁷⁹ A diverse workforce is essential in this field because it brings a range of perspectives and problem-solving approaches, which are crucial for developing robust cybersecurity measures.⁸⁰ The underrepresentation of women in IT means a lack of diverse viewpoints, which can lead to gaps

⁷⁴ Shitanshu Srivastava, "Women in Technology-Reasons for Underrepresentation and What Can Corporates Do to Improve the Gender Diversity," January 25, 2019.

⁷⁵ Ambreen Sarwar and Muhammad Kashif Imran, "Exploring Women's Multi-Level Career Prospects in Pakistan: Barriers, Interventions, and Outcomes," *Frontiers in Psychology* 10 (June 19, 2019), <https://doi.org/10.3389/fpsyg.2019.01376>.

⁷⁶ Qiguang An et al., "The Impact of the Digital Economy on Sustainable Development: Evidence from China," *Frontiers in Environmental Science* 12 (March 26, 2024), <https://doi.org/10.3389/fenvs.2024.1341471>.

⁷⁷ Ibid., 17.

⁷⁸ Ömer Aslan et al., "A Comprehensive Review of Cyber Security Vulnerabilities, Threats, Attacks, and Solutions," *Electronics* 12 (March 11, 2023): 1–42, <https://doi.org/10.3390/electronics12061333>.

⁷⁹ A. Shaji George, Dr Baskar, and P. Balaji Srikanth, "Cyber Threats to Critical Infrastructure: Assessing Vulnerabilities Across Key Sectors," *International Innovation Journal*, 02 (February 25, 2024): 51–75, <https://doi.org/10.5281/zenodo.10639463>.

⁸⁰ Saxena, "Workforce Diversity., p.12.

in understanding and addressing cybersecurity threats.⁸¹ This deficiency can be particularly detrimental when considering that cyber threats are constantly evolving and require innovative solutions.⁸² A homogeneous workforce may overlook certain threat vectors or fail to recognize the implications of certain security breaches, thereby weakening the overall cybersecurity posture of the country.⁸³

Moreover, the lack of gender diversity can impact the development of inclusive and comprehensive cybersecurity policies.⁸⁴ Women may have different security concerns and priorities, particularly in the context of digital privacy and data protection, which are increasingly important in the age of digital surveillance and data breaches.⁸⁵ Excluding these perspectives can result in policies that are less effective in protecting the entire population, thereby undermining national security.⁸⁶

▪ ***Economic Resilience and Competitiveness***

National security is closely linked to economic stability and resilience.⁸⁷ IT Industry plays a vital role in economic growth, strengthening the culture of innovation, and creating employment opportunities.⁸⁸ However, the gender gap in this sector limits the industry's potential, as it fails to fully utilize the available talent pool.⁸⁹ If a gender gap exists in the IT industry, it can have significant economic challenges because it can reduce the competitive advantage of affordable workforce.⁹⁰

⁸¹ Yasser Asiry, "Closing the Gap: Boosting Women's Representation in Cybersecurity Leadership," *Journal of Information Security* 15 (January 1, 2024): 15–23, <https://doi.org/10.4236/jis.2024.151002>.

⁸² Md Mallick and Rishab Nath, "Navigating the Cyber Security Landscape: A Comprehensive Review of Cyber-Attacks, Emerging Trends, and Recent Developments," *Journal of Information Security*, 15, no.3, February 21, 2024.

⁸³ Frank Cremer et al., "Cyber Risk and Cybersecurity: A Systematic Review of Data Availability," *The Geneva Papers on Risk and Insurance. Issues and Practice* 47, no. 3 (2022): 698–736.

⁸⁴ Nir Kshetri and Maya Chhetri, "Gender Asymmetry in Cybersecurity: Socioeconomic Causes and Consequences," *Computer* 55 (February 1, 2022): 72–77, <https://doi.org/10.1109/MC.2021.3127992>.

⁸⁵ Ibid., 73.

⁸⁶ Ibid., 76.

⁸⁷ Christian Fjäder, "The Nation-State, National Security and Resilience in the Age of Globalisation," *Resilience* 2, no. 2 (May 4, 2014): 114–29, <https://doi.org/10.1080/21693293.2014.914771>.

⁸⁸ Samwel Chege and Daoping Wang, "Information Technology Innovation and Its Impact on Job Creation by SMEs in Developing Countries: An Analysis of the Literature Review," *Technology Analysis & Strategic Management* 32 (August 6, 2019): 1–16, <https://doi.org/10.1080/09537325.2019.1651263>.

⁸⁹ Erin Young, Judy Wajcman, and Laila Sprejer, "Mind the Gender Gap: Inequalities in the Emergent Professions of Artificial Intelligence (AI) and Data Science," *New Technology, Work and Employment* 38, no. 3 (2023): 391–414, <https://doi.org/10.1111/ntwe.12278>.

⁹⁰ Ibid., 12.

As a diverse workforce represents various cultural and educational backgrounds; therefore, they are more likely to find unique and creative solutions to problems compared to the uniform teams.⁹¹ Finding creative solutions to the new problems is crucial for staying relevant in the global market, especially in the IT industry. The nature of work in the IT industry demands that teams find diverse solutions.⁹² If Pakistan does not utilize female workforce, it might not be able to compete with nations that have gender-inclusive policies.

Economic insecurity, resulting from gender inequality in the workforce, can also lead to broader societal instability.⁹³ High levels of unemployment and underemployment among women can contribute to economic disparities and social tensions, which can be exploited by extremist groups or hostile state actors.⁹⁴ Economic resilience is a cornerstone of national security, and ensuring that all citizens have equal opportunities to participate in the workforce is crucial for maintaining this resilience.⁹⁵

▪ ***Strategic Workforce Development***

The underrepresentation of women in the IT industry has implications for workforce development, particularly in areas critical to national security such as defense technology, data analytics, and Artificial Intelligence (AI).⁹⁶ These fields are essential for modern military and intelligence operations, and a diverse workforce is key to developing the innovative solutions needed to maintain a strategic advantage.⁹⁷

Women bring unique perspectives and problem-solving approaches, which are invaluable in complex fields like cybersecurity and defense technology.⁹⁸ By excluding women from these areas, Pakistan limits its capacity to develop cutting-edge technologies and strategies that are

⁹¹ Balazs Vedres and Orsolya Vasarhelyi, *Inclusion Unlocks the Creative Potential of Gender Diversity in Teams*, 2022.

⁹² Ibid., 7.

⁹³ Orazaliyev Kanat et al., "Gender Inequality and Poverty: The Role of Financial Development in Mitigating Poverty in Pakistan," *Journal of the Knowledge Economy*, October 26, 2023, <https://doi.org/10.1007/s13132-023-01527-y>.

⁹⁴ Ibid., 10.

⁹⁵ Maria Constantinescu, "Measuring Economic Resilience for the CEE and Black Sea Countries in the Framework of Comprehensive Defense," *Security and Defence Quarterly*, December 19, 2023, <https://doi.org/10.35467/sdq/175379>.

⁹⁶ Wasswa Shafik, "Dissecting the Role of Women in Cybersecurity and Information Technology: A Medical Perspective," 2024, 325–50, https://doi.org/10.1007/978-981-97-1249-6_15.

⁹⁷ Wilson W. S. Wong, *Emerging Military Technologies: A Guide to the Issues* (Praeger, 2013).

⁹⁸ Excelsior Staff, "Why Cybersecurity Needs More Women," *Excelsior University* (blog), March 5, 2024, <https://www.excelsior.edu/article/why-cybersecurity-needs-more-women/>.

essential for national defense.⁹⁹ This exclusion not only diminishes the country's technological capabilities but also its strategic autonomy, as reliance on foreign technologies and expertise can create vulnerabilities.¹⁰⁰

Furthermore, the lack of female representation in leadership and decision-making roles within the IT industry means that women's voices are often absent in discussions about national security priorities and strategies.¹⁰¹ This exclusion can lead to a narrow focus on traditional security concerns, neglecting emerging threats and opportunities in the digital realm. For example, issues such as cyber espionage, digital misinformation, and the ethical use of AI require diverse perspectives to address effectively. Without inclusive leadership, these challenges may not be adequately prioritized or addressed, compromising national security.

Implications for Policy and Governance

The underrepresentation of women in the IT industry also affects policy and governance related to national security.¹⁰² Gender perspectives are crucial in shaping policies that are inclusive and effective.¹⁰³ However, when women are underrepresented in key sectors like IT, their perspectives and experiences are often missing from policy discussions and decision-making processes. This exclusion can lead to the development of policies that do not fully address the needs and concerns of all citizens, particularly in areas related to digital rights, cybersecurity, and data protection. Inclusive governance is essential for developing comprehensive and effective national security strategies. By ensuring that women are represented in the IT sector and involved in policy-making processes, Pakistan can develop more balanced and inclusive policies that enhance national security. This inclusion can also help to address the root causes of gender inequality, thereby contributing to broader societal stability and resilience.

⁹⁹ Ibid., 23.

¹⁰⁰ Ibid., 15.

¹⁰¹ Md Asadul Islam et al., "Gender and Leadership in Public Higher Education in South Asia: Examining the Individual, Socio-Cultural and Organizational Barriers to Female Inclusion," *Studies in Higher Education* 48, no. 8 (August 3, 2023): 1197–1215, <https://doi.org/10.1080/03075079.2023.2187771>.

¹⁰² Jessica Ear, "Women's Role in Disaster Management and Implications for National Security" (Daniel K. Inouye Asia-Pacific Center for Security Studies, 2017), <https://www.jstor.org/stable/resrep14031>.

¹⁰³ Vanesa Hervías Parejo and Branko Radulović, "Public Policies on Gender Equality," in *Gender-Competent Legal Education*, ed. Dragica Vujadinović, Mareike Fröhlich, and Thomas Giegerich (Cham: Springer International Publishing, 2023), 405–28, https://doi.org/10.1007/978-3-031-14360-1_12.

Conclusion

Gender inequality in Pakistan's IT industry has profound implications for both human security and national security. The underrepresentation of women in this sector limits economic opportunities, contributes to personal and community insecurity, and exacerbates educational disparities. These factors collectively undermine human security, which is essential for the overall well-being and stability of the nation. Furthermore, the exclusion of women from the IT industry reduces the diversity of perspectives necessary for addressing complex cybersecurity threats and developing innovative technological solutions, thereby compromising national security. The importance of adopting a multi-faceted approach that includes promoting gender-sensitive policies, improving access to education and training, and fostering inclusive workplace cultures. By addressing these challenges, Pakistan can enhance its human security and national security, ultimately fostering a more resilient and equitable society. There is an urgent need for comprehensive strategies that not only address gender disparities but also integrate these efforts into broader national security frameworks.