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Bridging the Gap: Aligning Pakistan's Science, Technology, and Innovation Policy with SDG 5 on Gender Equality in the Workplace

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Abstract
Pakistan's emphasis on science, technology, and innovation (STI) has intensified over the past five decades, showcasing growing instances of effective practices. Numerous barriers to sustainable development exist in Pakistan; for instances, inequalities within and across emerging nations, such as Pakistan, are increasing, and significant discrepancies in opportunity, money, and power endure. Despite the growing focus of policymakers and organizations on incorporating gender into STI policies and programs to attain gender equality for all women and girls, inequality continues to pose a significant impediment to sustainable development across the continent. "The purpose of this study is to address the challenges faces by Pakistan for the execution of STI policies from the perspective of SDG 5.Data was collected from 70 faculty members through quantitative survey.This study analyses Pakistan's science, technology, and innovation policy, emphasizing the nation's initiatives to incorporate a mission-oriented component and human resource development connected to Sustainable Development Goal 5: gender equality. It concludes that while indications of such issues manifest as policies, the implementation of these policies for missions remains incomplete, and there is a deficiency in the execution of the code of conduct for gender equality, which adversely affects the implementation of STI policies for an innovative working environment.

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Key words: STI policy, code of conduct, challenges, components, SDG Five gender equality

Introduction

Over the past 50 years, Pakistan has placed a greater emphasis on science, technology, and innovation (STI), demonstrating an increasing number of successful practices. There are many obstacles to sustainable development in Pakistan; for example, disparities in opportunity, wealth, and power persist, and inequality both within and across emerging countries like Pakistan is growing (Hogg et al., 2022). Inequality remains a major barrier to sustainable development throughout the continent, even while organizations and governments are increasingly focusing on integrating gender into STI policies and programs to achieve gender equality for all women and girls. The nation's commitment to attaining SDG 5 on gender equality, the rise of disruptive work conditions, and the renewed emphasis on STI for human well-being are just a few of the many obstacles facing the implementation of STI policy (Hogg et al., 2022). Furthermore, because workplace harassment and discrimination regulations are in effect in all government agencies, problems with employee working conditions and the gender equality policy(Women_H_Work_Act_2022_Amendment.Pdf, n.d.) (Code of Conduct 2010) continue to exist. The successful implementation of new STI policies and SDG 5 on gender equality has been severely hampered by socioeconomic changes over the past ten years as well as a lack of knowledge about policy implementation and its effects on STI policy. Socioeconomic development, human resource development, research and development infrastructure, and science and technology management are the main components of STI policy. A gap in this study is the inability to implement policies effectively and the ability to deal with issues locally in Pakistan. (Yang et al., 2024). This research is the focus of a quantitative survey. Seventy academic members responded to this article. With a focus on the country's efforts to integrate a mission-oriented component and human resource development linked to Sustainable Development Goal 5: gender equality, this paper examines Pakistan's science, technology, and innovation policy. It comes to the conclusion that although policies are a sign of these problems, their implementation for missions is still lacking and the code of conduct for gender equality is not being followed properly, which has a negative impact on the implementation of (Wani et al., 2024) STI policies for a creative workplace.

The role of Science, Technology, and Innovation (STI) in promoting socioeconomic development in Pakistan is significant. Discuss the connection between STI and Sustainable Development Goal (SDG) 5, (Pakistan’s Implementation of the 2030 Agenda for Sustainable Development Goals: Voluntry National Review. SDG Section, Ministry of Planning, Development and Reforms, Government of Pakistan, Islamabad., 2019)which aims to tackle systemic gender biases and foster inclusive development. The interplay of Science, Technology, and Innovation (STI) is essential for promoting socioeconomic development in Pakistan, as it propels economic growth, enhances public services, and tackles societal challenges. The advancements hold

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considerable promise for making a substantial impact on Sustainable Development Goal (SDG) 5, which focuses on the attainment of gender equality and the empowerment of all women and girls.(Mohr et al., 2022)

A variety of STI strategies are implemented worldwide, across both developed and developing countries. National plans for STI appear to exert various influences on the formulation of government policy, primarily by aligning socioeconomic development with the government's STI vision. Next is the identification and prioritization of STI investments. Thirdly, it is essential to engage various stakeholders, including R&D organizations, financing entities, and businesses from both the public and private sectors, in the processes of policy development and implementation. (Pakistan's Implementation of the 2030 Agenda for Sustainable Development Goals: Voluntry National Review. SDG Section, Ministry of Planning, Development and Reforms, Government of Pakistan, Islamabad., 2019). Anticipated trends in STI policy include the identification of new sources for economic growth and competitiveness, the strategic focus on innovation within key technologies and industries such as agriculture, industry, nanotechnology, biotechnology, and ICT. Additionally, these trends consider global challenges like climate change, energy security, and the aftermath of the COVID-19 pandemic. There is also an emphasis on stabilising R&D expenditures, promoting demand-side innovation policies, enhancing social cohesion, and improving public health(Woolley & MacGregor, 2022)

STI in Pakistani background

Pakistan has a population of 207.774 million, with an average annual growth rate of 2.4% observed from 1998 to 2017. Located in Asia, Pakistan covers an area of 796,096 square kilometers, which is roughly equivalent to the combined land area of France and the United Kingdom. It ranks as the 36th largest country globally. Pakistan's location holds considerable importance as it serves as a junction between Asia and the Middle East. Pakistan and China share a border that measures approximately 523 kilometres, in contrast to India's border with Pakistan, which extends for 2,912 kilometres. Afghanistan has a border with Pakistan that extends for 2430 kilometres, defined by the Durand Line, which is located to the west of Pakistan.("NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY 2021," 2015)

In the analysis of the past three years, Pakistan has demonstrated significant progress in achieving macroeconomic stability. Pakistan has achieved macroeconomic stability over the past three years: the country has recorded a growth rate of 4.7%, increased its international reserves to $8 million, and reduced the budget deficit from 8% to below 5%. Pakistan's economy has maintained its growth trajectory, with a GDP growth rate of 5.28%, reflecting an increase compared to the last decade. The industrial sector, accounting for 20.9% of the overall GDP, demonstrated consistent growth when analyzed against previous years. There is a 19.5% growth contribution from the agriculture sector to Pakistan's GDP. Agriculture serves as the foundation of the nation's economy, generating the essential raw materials for various enterprises that enhance value and engage 42.3% of the labor force. Consequently, it plays a vital role

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in national development, ensuring food security, and addressing poverty. In 2015, government expenditure on education constituted a mere 2.45% of the Gross Domestic Product. Since 2008, when education spending was at 2.75% of GDP, there has been a consistent annual increase. The government has pledged to allocate at least 1% of GDP to higher education by the year 2018.(Mujtaba et al., 2024) The enhancement of the nation's STI system is achievable through the implementation of science and technology policy that aligns with the STI Strategy and Pakistan's inaugural STI strategy. The management of the S&T industry has been under the PCST since 1962, operating under the guidance of the state ministry STI. In 2012, the Pakistan Council for Science and Technology (PCST) established the inaugural national Science and Technology Index (STI) for Pakistan.

The emphasis of the STI policy is on the necessity of endogenous technological development, increased transfer of technology, development of human resources, and international research and development. (Saleem et al., 2024). However, there is a lack of information regarding the progress made, including whether the policy has been implemented fully or partially since its publication. Furthermore, PCST developed the NSTIS policy for the years 2014 to 2018 and solicited public feedback on it. For the first time in Pakistan, Vision 2025, the government's long-term development goal, now incorporates this strategy. By the end of 2018, R&D spending is projected to rise from 0.29 percent of GDP in 2013 to 1 percent of GDP, as indicated by NSTIS (2014-2018), emphasising the importance of human development. Research and development intensity as of 2018.

The expansion of the STI system in Pakistan is significantly supported by the rising GERD/GDP ratio. The ministry is particularly focused on enhancing the performance of the R&D sector through public investments in both civilian and military technologies, as well as through state-run organizations. The findings from a 2013 R&D study conducted by PCST indicate that 75.3% of R&D expenditures are allocated to firms within the public sector. In the realm of research, the natural sciences account for one out of every four researchers, with agricultural sciences, engineering, and technology following closely behind.(Nawaz et al., 2022) The higher education sector employs a significant number of state researchers, a trend that has become increasingly evident since 2011.

STI in Socioeconomic Development

STI functions as a driving force for industrialization and the generation of employment opportunities. Technological innovations enhance efficiency across various sectors, including agriculture, manufacturing, and services, which in turn has a direct effect on GDP growth, and this is also evident in Encouraging innovation in small and medium enterprises (SMEs) fosters entrepreneurship and enhances competitiveness, both of which are essential for economic sustainability.(Bagherinejad & Mood, 2020) Advancements in STI enhance healthcare outcomes by leveraging modern medical technologies and telemedicine initiatives, thereby improving the overall quality of life. Education technology (EdTech) serves as a crucial tool in addressing literacy disparities, especially in remote regions, by

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facilitating access to high-quality educational resources. Green technologies and sustainable innovations enhance climate resilience through the promotion of renewable energy and sustainable agricultural practices, which are essential for Pakistan's environment-sensitive economy.

Challenges of STI Policy in 2022

Support to the National Sectorial Policies

The achievement of goals across various economic sectors, such as agriculture, industry, trade, commerce, health, education, the environment, and tourism, is facilitated by the national STI policy. A variety of new sector-specific national policies have been introduced since the approval of the last STI Policy in 2012.(Mclaren & Kattel, 2022) The sectorial policymakers encompass a variety of initiatives that can be executed through the application of science, technology, and innovation. In order to align STI initiatives with the goals of the departmental national policies, it is essential to formulate a new national STI policy.

Achievement of the Sustainable Development Goals (SDGs)

In 2015, all UN Member States endorsed the Sustainable Development Goals (SDGs) as a global initiative aimed at eradicating poverty, protecting the environment, and ensuring that all individuals can live in prosperity and peace by the year 2030. In 2016, Pakistan achieved a significant milestone by unanimously passing the SDGs 2030 agenda, marking it as the first country to integrate these goals into its national development strategy, thereby demonstrating political commitment and ownership. (Miedzinski et al., 2022)The Centre's planning and development ministry has established a dedicated SDGs Section to facilitate monitoring and coordination efforts. The administration of Pakistan and In 2018, the UN established the Pakistan One United Nations Program III (OP III) for the period of 2018–2022, which is often referred to as the UN Sustainable Development Framework (UNSDF).

The advancement differs among developed, emerging, and developing nations. In Pakistan, women constitute 49% of the population; however, their representation in the labour force is only approximately 24% (ILO, 2018a). The under-representation of women in the workforce has garnered significant global attention, leading to its inclusion in the United Nations' 2030 Agenda for Sustainable Development. This agenda focusses on the attainment of full-time employment and the establishment of equitable working conditions for all individuals, irrespective of gender or disability, aligning with Sustainable Development Goal (SDG) No. 8, Target 8.5. In a similar vein, the United Nations' SDG No. 5 focusses on the empowerment of all females and the promotion of gender equality across all aspects of life. The rising presence of women in the workforce has led to significant gender-related issues and challenges. High work demands, lack of social support, and harassment have been recognised as significant challenges that women encounter in the workplace (Camkin et al., 2022) (statistics report, 2019). An Examination of Government Transparency in Relation to the Sustainable Development Goals (SDG) 2030 Agenda In 2015, 195 nations reached an agreement with the United Nations to implement changes aimed at

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improving the world. The objective will be achieved through the collaboration of their respective governments, businesses, media, institutions of higher education, and local NGOs, all aimed at enhancing the quality of life for the population by the year 2030.

Goal 5: Gender equality

Eliminating discrimination against women and girls is fundamentally a human right and essential for a sustainable future. Evidence indicates that the empowerment of women and girls contributes significantly to economic growth and development. UNDP has prioritized gender equality in its initiatives, resulting in significant advancements over the last two decades. The current enrolment of girls in schools has increased significantly compared to 15 years ago, with most regions achieving gender parity in primary education.(Pakistan's Implementation of the 2030 Agenda for Sustainable Development Goals: Voluntry National Review. SDG Section, Ministry of Planning, Development and Reforms, Government of Pakistan, Islamabad., 2019) Despite the increasing presence of women in the labor market, significant disparities persist in certain regions, where women are consistently deprived of equal work rights compared to men. Sexual violence and exploitation,(Buisson et al., 2022) the disproportionate allocation of unpaid care and domestic responsibilities, along with discrimination in public institutions, continue to present significant obstacles. The impact of climate change and disasters is notably skewed, affecting women and children more significantly, alongside the challenges posed by conflict and migration. It is essential to ensure that women have equal rights to land and property, access to sexual and reproductive health services, and the ability to utilize technology and the internet. Currently, the representation of women in public organizations is at an all-time high; however, fostering the development of more women leaders is essential for advancing gender equality.

Development focused on sustainability Goal five on gender equality includes the following targets.

Eliminate all types of discrimination directed at women and girls globally.

Remove all instances of violence directed at women and girls in both public and private domains, encompassing trafficking, sexual exploitation, and other forms of abuse.

Remove all detrimental practices, including child, early, and forced marriage, as well as female genital mutilation.

Acknowledge and appreciate the significance of unpaid care and domestic work by implementing public services, infrastructure, and social protection policies, while fostering shared responsibility within households and families as deemed suitable at the national level.

Guarantee women's comprehensive and effective involvement, along with equal opportunities for leadership across all tiers of decision-making in political, economic, and public spheres.

Facilitate universal access to sexual and reproductive health and rights, in alignment with the agreements established in the Programme of Action from the International

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Conference on Population and Development, the Beijing Platform for Action, and the resultant documents from their review conferences.
Implement reforms to ensure that women have equal rights to economic resources, including ownership and control over land and other forms of property, access to financial services, inheritance, and natural resources, in alignment with national laws.
Strengthen the application of enabling technology, especially information and communications technology, to foster the empowerment of women.
Implement and enhance effective policies and enforceable laws to promote gender equality and empower all women and girls across all levels.

ACT 2010 CODE OF CONDUCT

The Protection against Harassment of Women at Workplace Act 2010 (Code of Conduct) was enacted on January 21, 2010. The code of conduct constitutes an integral component of a registered organization in Pakistan.(The Protect against Harassment of Women at Workplace Act 2010, n.d.)
The act stipulates that every organization must establish a committee consisting of three members, with the requirement that at least one member be a woman. This committee will address the harassment complaints and related issues. If the code of conduct is too difficult to understand, AASHA, a prominent NGO operating in Pakistan, has prepared it in both linguistic English and Urdu. This code of conduct serves as a guideline for the behavior of employees, management, and owners within an organization, aiming to ensure a harassment-free workplace environment. Additionally, it is the management's responsibility to educate employees about this act and the consequences of violating the code of conduct. Legislation has established the Workplace Harassment Act (2010), (Yousaf & Schmiede, 2016)which the HEC has mandated as compulsory. However, as of 2014, the higher education institution in question has not complied with this requirement. In 2016, certain provinces of Pakistan, characterized by a lack of gender complexity, failed to adequately enforce and pass the harassment Act. This indicates not only a lack of sensitivity towards the issue of women's harassment but also a minimal level of concern regarding the matter.

Research data Variations of Participate

Faculty	Faculty members of higher education institution jamshoro
University type	Public sector
University size	Small and large
Data sampling	70
Area	District jamshoro

The data provides a brief summary of faculty characteristics and the context in which the data was collected. The dataset focuses on faculty members from higher education institutions in Jamshoro. This indicates that the study or analysis targets academic staffs, which are integral to the functioning and performance of these institutions.

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Public universities are often state-funded and cater to a broader range of students, emphasizing accessibility and affordability. The results might reflect policies, practices, and challenges unique to public sector education.

This diversity allows for comparisons between institutions of varying scales, potentially uncovering differences in faculty experiences, resources, and institutional dynamics and total sample size of 70, it is likely that 70 faculty participate provided the data to use in exploratory research, With several universities, Jamshoro is regarded as a center of education in Pakistan. By concentrating on jamshoro district, one gained an understanding of the academic environment in this important area. Understanding faculty staff, possibilities, and difficulties in public universities in Jamshoro may be greatly aided by the findings. there are three major universities are focused in this research and these universities are related to multidisciplinary field to possible generalizations to other public sector institutions with similar features, even if the focus is on Jamshoro. The initiative aims to improve teaching quality, faculty experiences, and institutional governance in public universities by providing insightful data. This regionally focused and diverse approach offers a solid foundation for analyzing faculty-related issues, potentially influencing public higher education policies and procedures.

Alignment with SDG 5

Reducing Gender Bias:

By endorsing women's involvement in STEM (Science, Technology, Engineering, and Mathematics) disciplines, (Stamarski & Son Hing, 2015)STI offers chances to struggle systematic gender partialities. Women in leadership positions at STI have the ability to promote inclusive policies that give others in society more influence.

Promoting Inclusivity:

Women and girls are guaranteed admittance to education and employment opportunities in high-growth industries (Pakistan’s Implementation of the 2030 Agenda for Sustainable Development Goals: Voluntry National Review. SDG Section, Ministry of Planning, Development and Reforms, Government of Pakistan, Islamabad., 2019)when gender equality is integrated into STI policy supporting innovation that is suited to solving issues that are irreplaceable to women like safety applications and maternity health technologies.

Policy Integration:

In order to align STI policies with SDG 5, national development plans must incorporate gender-focused frameworks and promote equal opportunities for scientific research and technological innovation(Mohr et al., 2022).

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Statistics

		Reducing gender bias	Promoting inclusivity	Policy integration	STISDG5
N	Valid	70	70	70	70
	Missing	0	0	0	0
Mean		15.8429	15.6857	16.4571	19.4286
Std. Deviation		4.19329	4.25473	3.06776	3.25074

The table is shows statistical measures table and its related to respondent or scores for 4 variables: first one is **Reducing Gender Bias** second **Promoting Inclusivity**, third **Policy Integration**, and last variable is **STI SDG 5** (possibly referring to Science, Technology, and Innovation (STI) under Sustainable Development Goal 5 on gender equality). There were 70 valid respondent with no missing data and its indicates the dataset is complete for these variables. Variables mean are showing that **Reducing Gender Bias**: Mean = (15.84), **Promoting Inclusivity**: Mean = (15.69), **Policy Integration**: Mean = (16.46), **STI SDG 5**: Mean = (19.43), these means reflect the average scores or ratings for each variable. STI SDG 5 has the highest average score, suggesting it might be perceived as more effective or significant than the other three areas. **Standard Deviation (Std. Deviation)**: **Reducing Gender Bias**: 4.19, **Promoting Inclusivity**: 4.25, **Policy Integration**: 3.07, **STI SDG 5**: 3.25, Standard deviation measures the spread or variability in the respondents. Largest values are showing that more variability in opinions or ratings. **Promoting Inclusivity** has the highest variability, while **Policy Integration** has the lowest, indicating more dependable responses for the concluding. Suggests finding is emphasis or attainment in the domain of **STI SDG 5**, given its higher mean score. **Reducing Gender Bias** and **Promoting Inclusivity** have comparable means but higher changeability, indicating a broader range of perceptions among respondents. **Policy Integration** shows consistency in responses, possibly implying a more undying agreement or understanding among the participants.

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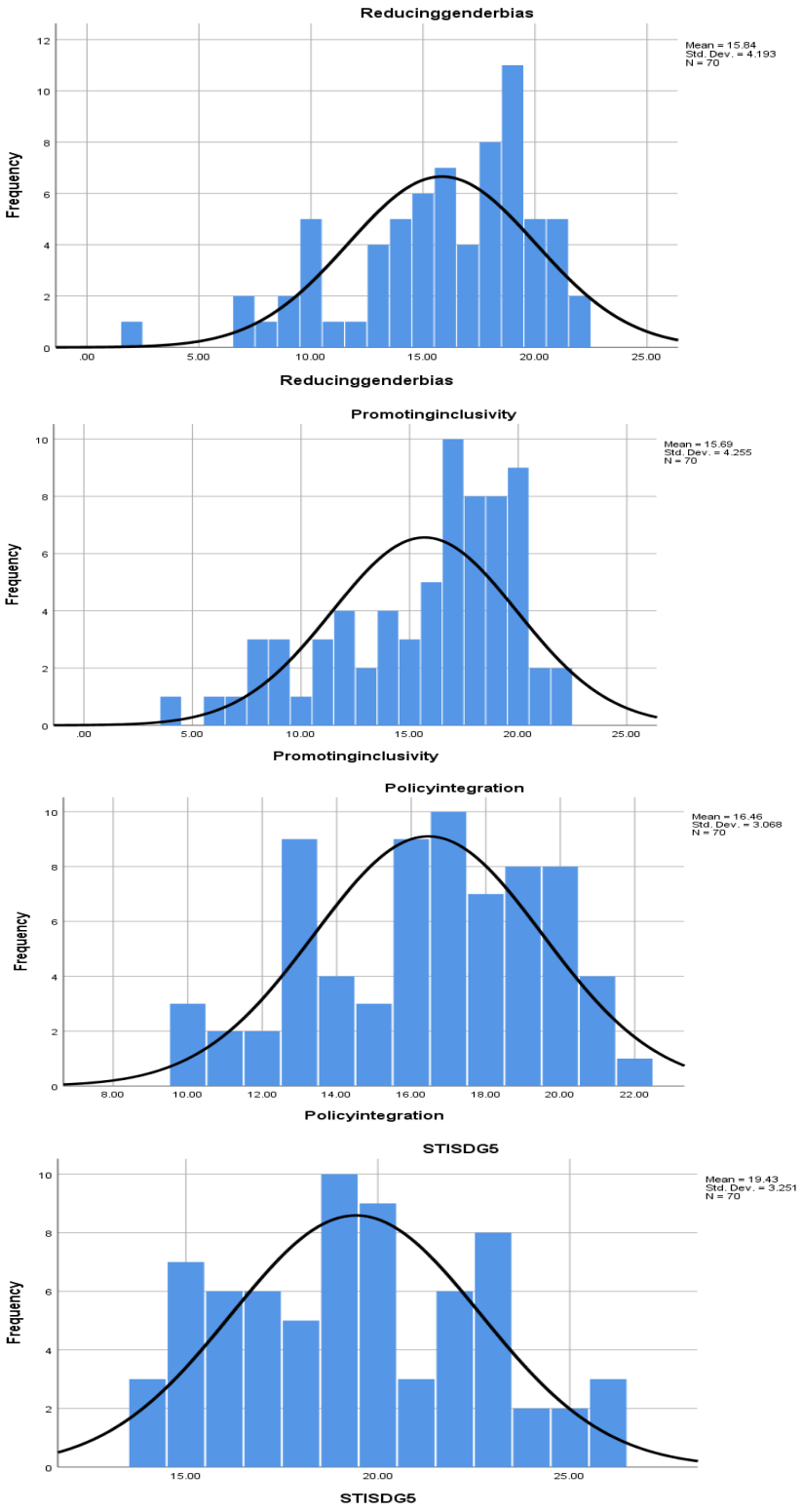

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Measures efforts or perceptions related to reducing gender bias. Reflects efforts or opinions on promoting inclusivity and Evaluates how well gender considerations are integrated into policies. STI SDG 5 Likely pertains to Science, Technology, and Innovation (STI) under Sustainable Development Goal 5 (SDG 5), which focuses on gender equality.

Perception of STI SDG 5: The high mean score (19.43) and relatively low variability (3.25) suggests that respondents generally agree on its significance or effectiveness in advancing gender equality. Consistency in Policy Integration: The lowest standard deviation (3.07) for Policy Integration indicates that respondents have a more uniform view of gender integration into policies. Varied Opinions on Inclusivity: The highest variability (4.25) for Promoting Inclusivity suggests that respondents have differing opinions or experiences regarding inclusivity efforts. The dataset reflects the relative importance and perceived effectiveness of the four variables. The higher mean for STI SDG 5 emphasizes its centrality, while variability in Promoting Inclusivity highlights areas where opinions are less aligned, potentially signaling a need for targeted interventions to address divergent perspectives. the variables STI SDG 5, Reducing Gender Bias, Promoting Inclusivity, and Policy Integration grouped by different levels of STI SDG 5 (ranging from 14 to 26). Across all levels of STI SDG 5, there are 70 valid responses for each variable with no missing data. STI SDG 5,: Mean = 15.84, Std. Deviation = 4.19, Reducing Gender Bias: Mean = 15.69, Std. Deviation = 4.25, Policy Integration: Mean = 16.46, Std. Deviation = 3.07, The relatively lower standard deviations for Policy Integration suggest more consistent responses compared to the other variables. As the level of STI SDG 5 increases, the means of the other three variables generally increase.

Measures of Association

	R	R Squared	Eta	Eta Squared
Reducing gender bias * STISDG5	.617	.381	.666	.443
Promoting inclusivity * STISDG5	.473	.224	.545	.297
Policy integration * STISDG5	.479	.229	.571	.326

The table provides Measures of Association between STI SDG 5 and the three variables (Reducing Gender Bias, Promoting Inclusivity, and Policy Integration). R (Correlation Coefficient) Measures the strength and direction of the linear relationship between two variables. Values range from -1 to 1, where values closer to 1 or -1 indicate a stronger relationship. R Squared represents the proportion of the variance in the dependent variable that is explained by the independent variable. Values range from 0 to 1; higher values indicate a stronger explanatory power. Eta (Effect Size) Measures the strength of the association between variables in ANOVA, including non-linear relationships. Values range from 0 to 1; higher values indicate a stronger effect. Eta Squared Represents the proportion of variance in the dependent variable accounted for by the independent variable, including both linear and non-linear relationships.

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Reducing Gender Bias and STI SDG 5, R = 0.617: Indicates a strong positive linear relationship. R Squared = 0.381 about 38.1% of the variance in Reducing Gender Bias is explained by STI SDG 5. Eta = 0.666: Suggests a strong overall association, considering both linear and non-linear effects. Eta Squared = 0.443: Approximately 44.3% of the variance in Reducing Gender Bias is accounted for by STI SDG 5. Promoting Inclusivity and STI SDG 5, R = 0.473**: Indicates a moderate positive linear relationship. R Squared = 0.224: About 22.4% of the variance in Promoting Inclusivity is explained by STI SDG 5. Eta = 0.545: Suggests a moderate-to-strong overall association. Eta Squared = 0.297: Approximately 29.7% of the variance in Promoting Inclusivity is accounted for by STI SDG 5. Policy Integration and STI SDG 5, R = 0.479: Indicates a moderate positive linear relationship. R Squared = 0.229: About 22.9% of the variance in Policy Integration is explained by STI SDG 5. Eta = 0.571: Suggests a moderate-to-strong overall association. Eta Squared = 0.326: Approximately 32.6% of the variance in Policy Integration is accounted for by STI SDG 5. The strongest association is between Reducing Gender Bias and STI SDG 5 (highest R, R Squared, Eta, and Eta Squared). Both Promoting Inclusivity and Policy Integration show moderate positive relationships with STI SDG 5, with Policy Integration slightly stronger than Promoting Inclusivity. The higher values of Eta compared to R in all three variables suggest that while the relationships are primarily linear, non-linear factors may also contribute to the associations. Advancements in STI SDG 5 strongly influence improvements in Reducing Gender Bias, with moderate effects on Promoting Inclusivity and Policy Integration. These results highlight the importance of STI and SDG 5 as a key driver in addressing gender equality challenges.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.796	.807	4

The reliability analysis using Cronbach's Alpha assesses the internal consistency of the scale, indicating how well the set of four items (variables) measures a single construct. Cronbach's Alpha: 0.796 indicates a high level of internal consistency among the four items. A value above 0.7 is generally considered acceptable for social sciences, suggesting the items are sufficiently related and measure the same underlying concept. Cronbach's Alpha Based on Standardized Items: 0.807 slightly higher than the raw Cronbach's Alpha. the standardization of item scores and reflects the reliability of the items after equalizing variances across them. The similarity between the two alpha values suggests that item variances do not strongly influence the reliability and Indicates that the reliability calculation is based on four variables: Reducing Gender Bias, Promoting Inclusivity, Policy Integration, and STI SDG 5. A Cronbach's Alpha of 0.796 indicates that the items are moderately to highly correlated, contributing to a consistent scale for measuring related aspects (gender equality efforts under STI SDG 5). The reliability score suggests that the scale can be confidently used for further statistical analysis, such as factor analysis or composite

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scoring. While the reliability is good, it is slightly below the threshold of 0.8, which is often preferred for high-stakes assessments. Reviewing item-specific contributions item-total correlations might reveal whether any specific item weakens the overall consistency.

Challenges and Opportunities

While the potential for STI to support SDG 5 is immense, significant barriers remain, including:

Cultural norms and societal resistance limiting women's participation in STI.

Lack of targeted policy enforcement and monitoring mechanisms.

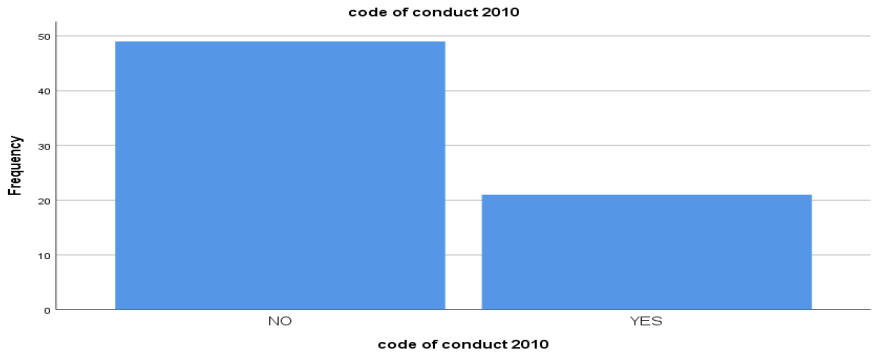
Inadequate representation of women in STEM education and professional settings.

Pakistan's path to aligning STI with SDG 5 requires a concerted effort involving policy reform, capacity-building programs, and international collaborations. Initiatives to empower women in STI not only address gender inequalities but also amplify the socioeconomic benefits of innovation across all sectors. While the potential for Science, Technology, and Innovation (STI) to advance Sustainable Development Goal (SDG) 5 gender equality is immense, significant barriers must be addressed for effective alignment in Pakistan. These barriers include:

Progress in STI in Pakistan

Discuss Pakistan's strides in STI over the past five decades, including advancements in policy frameworks and institutional developments. Acknowledge achievements while noting persisting challenges like: Underrepresentation of women in STI fields, Systemic socio-cultural barriers that hinder equitable participation, Limited access to educational and professional opportunities for women

Challenges in Policy Implementation



Analyze the existing policies, such as the Code of Conduct 2010 addressing workplace harassment and gender discrimination, and their gaps in implementation: there are Lack of monitoring and enforcement mechanisms and Insufficient awareness among stakeholders about gender-focused policies and the Cultural resistance to women's active participation in STI sectors.

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The Role of SDG 5

Elaborate on how SDG 5 aims to integrate gender equality into STI frameworks by Promoting gender equity in education, employment, and leadership roles and Highlighting international benchmarks like the European Commission's gender strategies and the UN's EQUALS program, which can be adapted to Pakistan's needs.

Workplace Conditions in STI code of conduct 2010

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	49	70.0	70.0	70.0
	YES	21	30.0	30.0	100.0
	Total	70	100.0	100.0	

The majorities of respondents (70.0%) do not adhere to or recognize the Code of Conduct, indicating a potential lack of awareness, relevance, or compliance. Smaller proportions (30.0%) adhere to or recognize the Code, suggesting that compliance is limited. With no missing responses, the dataset is comprehensive, reflecting the entire sample population. The significant majority (70.0%) not adhering to the Code suggests a need for better communication, training, or enforcement of the 2010 Code of Conduct. The results might signal that the Code of Conduct (2010) is outdated or lacks relevance to current practices, necessitating a review to ensure it aligns with stakeholders' expectations and needs. Additional analysis could explore the reasons behind non-adherence, such as organizational culture, lack of awareness, or perceived ineffectiveness of the Code. The data highlights that adherence to the Code of Conduct (2010) is limited, with only 30.0% compliance among respondents. This suggests an opportunity to improve awareness, alignment, or enforcement to increase adherence levels and ensure the Code's effectiveness in guiding behavior. Detail the adverse conditions women face in STI workplaces: Harassment and discrimination, despite existing policies and it Disruptive and non-supportive work environments and Limited mentorship and advancement opportunities.

Finding

To align STI with SDG 5 and overcome these barriers, Pakistan must adopt a holistic approach first of all Strengthen existing policies by embedding gender equity goals into STI development frameworks. To ensuring adequate funding for gender-focused initiatives and there are important to attain Train educators, policymakers, and industry leaders on the importance of gender equality in STI, focusing on creating inclusive environments. Adopt some practical implication from global best practices, such as the European Commission's Gender Equality Strategy and the UN's EQUALS initiative, to tailor strategies suited to Pakistan's socio-economic context. Empowering women in STI sectors not only addresses gender inequalities but also amplifies the economic and social benefits of innovation, paving the way for sustainable and inclusive growth. By overcoming cultural resistance, enhancing

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policy enforcement, and improving representation, Pakistan can unlock the full potential of STI to drive SDG 5 forward

Deeply entrenched cultural norms in Pakistan often limit women's participation in STI fields, particularly in rural areas. Traditional gender roles and biases discourage women from pursuing education and careers in STEM (Science, Technology, Engineering, and Mathematics). Awareness campaigns and grassroots initiatives could challenge stereotypes. Programs like the STEM Girls Initiative, implemented in various countries, have proven effective in breaking cultural barriers by engaging communities in discussions about women's roles in technology and innovation. While policies like the Code of Conduct 2010 address workplace harassment and discrimination, weak enforcement and lack of monitoring mechanisms limit their impact. There is often no systematic evaluation to ensure these policies achieve their objectives. Introducing robust monitoring frameworks, periodic reviews, and accountability measures can enhance the effectiveness of gender-focused policies. Empowering independent oversight bodies to evaluate STI workplaces could help ensure compliance.

Women are underrepresented in STEM fields due to limited access to quality education, scholarships, and mentorship programs. Gender biases in hiring and career progression exacerbate this issue, further reducing female participation in STI leadership roles. Targeted programs encouraging girls to enter STEM fields, such as providing scholarships and mentorship opportunities, can increase participation. Success stories from organizations like UNESCO's STEM mentorship programs highlight the value of such initiatives.

Recommendations

Facilitate the thorough execution and assessment of gender equality policies within STI sectors. Formulate specialized oversight bodies or committees to evaluate the implementation of gender equality initiatives. Integrate quantifiable Key Performance Indicators (KPIs) into organizational objectives to assess gender parity. Implement systematic gender audits within STI organizations to evaluate the consistency of policies with actual conditions on the ground. Leverage audit findings to enhance policies and identify gaps, facilitating adaptive and responsive measures. Implement obligatory reporting standards for organizations to reveal advancements in gender equality goals. Release yearly reports that encapsulate accomplishments, obstacles, and prospective strategies to ensure accountability. Implement sanctions for failure to adhere to gender equality policies. Provide incentives to organizations that show substantial advancements in reaching gender equity. Equip employees with the necessary knowledge and skills to foster an inclusive and equitable workplace. Develop workshops focused on gender sensitization for employees at all levels, highlighting the importance of addressing unconscious bias, preventing harassment, and fostering inclusive leadership practices. Educate managers and HR personnel to identify and address systemic barriers that impact gender equity. Facilitate mentorship opportunities, particularly for female professionals, to assist them in navigating career advancement within STI fields. Develop resource hubs that provide technical training,

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career guidance, and networking opportunities. Organize peer-learning forums that enable employees to exchange effective strategies for promoting inclusivity. Involve male allies by implementing targeted programs that motivate them to support initiatives aimed at promoting gender equity. Recognize and incentivize employees and teams that advocate for gender-inclusive practices to establish role models within the organization. Transform societal views and highlight the significance of gender equity in science, technology, and innovation for driving economic growth and fostering innovation. Implement campaigns across various media platforms, highlighting the achievements of women in STI. Engage with influencers and public figures to enhance the message and extend its reach to broader audiences. Organize seminars, workshops, and roadshows aimed at schools, universities, and community centers to motivate young women. Create and disseminate instructional resources that elucidate the economic and social advantages associated with gender equity. Organizations should be urged to integrate gender equity messaging into their branding and marketing strategies. Observe "Gender Equality Days" to enhance understanding and encourage discussion surrounding the topic. Facilitate discussions among policymakers, academics, and activists to examine the essential impact of gender equity on national development. Distribute policy briefs that detail practical recommendations for attaining gender parity. Utilize international knowledge and resources to establish effective gender equity frameworks specifically designed for the STI landscape in Pakistan. Engage with global entities like UNESCO and UN Women to analyses and understand effective gender equity programs implemented across different regions. Modify internationally acknowledged frameworks such as Athena SWAN or Gender Equality Seal to fit the cultural and organizational landscape of Pakistan. Collaborate with international STI organizations to develop research initiatives and technological solutions that priorities gender inclusivity. Conduct and disseminate research that examines the relationship between gender equity and innovation. Implement exchange programs for policymakers, educators, and professionals to acquire knowledge on gender equity strategies employed in other countries. Engage international specialists to facilitate workshops and seminars in Pakistan. Obtain international grants and funding for projects focused on gender equality in science, technology, and innovation. Allocate these resources to test innovative solutions and expand successful initiatives. When these strategies are systematically implemented, they have the potential to significantly enhance gender equity in STI sectors, while also fostering wider societal and economic advantages.

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