

## ABSTRACT

Science, Technology, and Innovation (STI) policies are pivotal for the advancement of a nation, playing a crucial role in shaping its developmental strategy. This research delves into the historical context of Pakistan, specifically examining its STI policies and their implementation. The policies of 1984 marked a significant shift towards promoting science, whereas subsequent policies, particularly those in 1993, lacked cabinet approval despite having an action plan. Notably, the policies of 2012 and 2022 were identified as lacking a concrete action plan for successful implementation.

To address this gap, the study established four primary objectives: to compare the STI policies of Turkey, Iran, and Pakistan based on six STI components; to measure policy responses through assessment matrices of 22 indicators; to identify gaps in policy institutes concerning dimensions of importance including the human capital, R&D projects, and entrepreneurial opportunities; and finally, to propose future dimensions for policy improvement through a new NASTIC (Need Assessment Science, Technology and Innovation Cycle) framework to diagnose and meet the identified gaps in the STI policy system.

The study meticulously examined the six stages of the policy life cycle in Pakistan and established the research propositions. Stakeholders from academia, industry and government were engaged in focused interviews, revealing that Pakistan excels in 'Policy Making' and 'Agenda Setting' but falters in 'Policy Development,' 'Policy Adoption,' 'Policy Implementation,' and 'Policy Evaluation.' Consequently, projects often fail to reach completion due to the poor execution of these crucial stages.

A comparative analysis of Pakistan, Turkey, and Iran was conducted using six components and 22 policy responses of Omar framework including multiple STI indicators such as R&D expenditure, planning and management structures, R&D organizations, higher education institutes, publications, patents, technicians in R&D, national innovation systems, global competitiveness, and rankings. The study revealed that while Turkey focused on infrastructure development, particularly roads for international connectivity, Iran concentrated on oil reserves and infrastructure,

whereas Pakistan primarily invested in software and IT development. However, Pakistan struggled to meet international market standards due to underdeveloped human capital, R&D and lack of entrepreneurial opportunities.

The study addressed key societal issues related to STI in Pakistan by evaluating the availability of dimensions of importance (human capital, R&D and entrepreneurial opportunities). It was observed that R&D funding was often directed towards development rather than research, leading to a dearth of research activities. Human capital lacked specialized trainings and relevant expertise are insufficient and hindering Pakistan's ability to compete globally.

To resolve these issues, the study referred to Omar Abdul Rehman's six components and 22 responses in his book 'Science, Technology & Innovation Policy.' The research findings emphasized the need of knowledgeable and relevant human capital, increased funding for relevant R&D projects, and emphasis on of looking for the entrepreneurial opportunities. However, the study also recognized the importance of maximizing the existing resources before initiating new endeavors.

In response to the identified issues, the study proposed the Need Assessment of Science, Technology and Innovation Cycle (NASTIC) framework. NASTIC comprises four levels: Components Analysis at Policy Life Cycle, Policy Responses in National Policies and Plans, Identification of Institutional gaps and Ideation of Action Plan, and Development of New Components and Responses. This framework aims to bridge the existing gap in Pakistan's STI policies and their implementation, providing a comprehensive approach to address the key societal challenges in Pakistan by developing an appropriate action plan for National STI Policy 2022.

In conclusion, this research offers a thorough examination of Pakistan's STI policies, identifies critical gaps, and proposes the NASTIC framework as a viable method for devising the action plan. The findings are essential for policymakers, researchers, and stakeholders at Ministry of Science and Technology (MoST) and aiming to enhance Pakistan's STI system and contribute to the nation's sustainable development.

**Keywords:** STI policy, Pakistan, Turkey, Iran, 6 STI Components, 22 Policy Responses, R&D, Entrepreneurship, Human Capital, NASTIC.