پنل اول

# آینده‌نگاری فناوری و نوآوری و نقش آن در حکمرانی

سازمان پژوهش‌های علمی و صنعتی ایران

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# Behind the STI Governance

## پشت پرده حکمرانی علم، فناوری و نوآوری

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# Problem Formulation

**Why do developing nations invest billions in STI but still face persistent gaps?**

- Global South invests heavily in STI, yet persistent **implementation gaps** remain.
- Traditional explanations:
  - Weak institutions
  - Resource limits
  - Bureaucratic fragmentation
- But a deeper factor is often overlooked.

## The Realist–Liberal (network) Spectrum

- Here you can see the two approaches we used to differentiate different systems in our research:

- **Realist**-leaning governments tend to adopt centralized, top-down approaches, prioritizing strategic autonomy, protectionism, and limited international engagement

- **Liberal/network**-oriented systems typically embrace open knowledge exchanges, multilateral collaborations, and participatory governance, emphasizing transparency and institutional accountability as central principles

Please note that some of the analyses in this presentation are based on available online data, which may have led to minor misunderstandings. However, the results remain valid.

I don't see any advantage for either approach, and each may be more efficient than the other under specific conditions.

## The Realist–Liberal Spectrum: dimensions of governance

| Dimension | Realist Orientation | Liberal Orientation |
|---|---|---|
| Cooperation Openness | Bilateral, strategic alliances only; minimal external input | Multilateral participation; openness to external expertise |
| IP & Knowledge Sharing | Strong national IP protectionism; limited tech diffusion | Open IP policies; tech licensing and public knowledge access |
| Multilateral Engagement | Low or transactional engagement with global STI institutions | Active integration with international STI frameworks |
| Stakeholder Breadth | Centralized control by executive agencies | Inclusion of academia, industry, civil society in co-design |
| Budgetary Commitment | Project-based funding, prone to political shifts | Multi-year budgets with cross-party or statutory support |

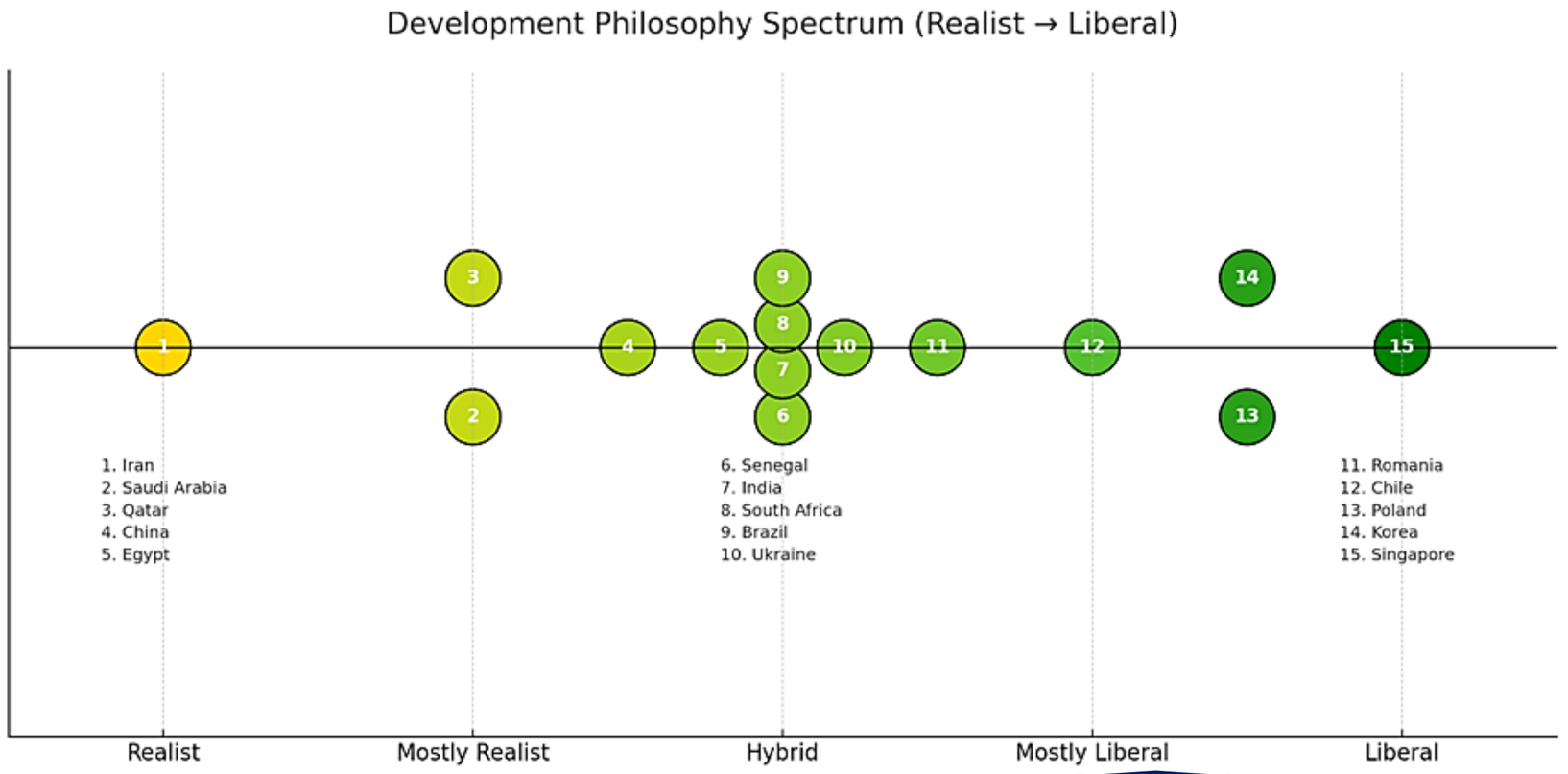
## Comparative Cases (1/2)

| Country | Development-philosophy orientation | STI governance approach (headline) | Key policy instruments / flagships | Historical shifts |
|---|---|---|---|---|
| Iran | Realist-ideological sovereignty focus | Centralized, ministry-segmented | Vision 1404, targeted subsidies | Little reform since 2005 |
| South Africa | Hybrid (liberation realism → incremental liberal) | Inclusionary yet fragmented | STI Decadal Plan, R&D tax credits, SKA | Gradual liberalization post-1994 |
| India | Pragmatic hybrid, “Atmanirbhar” autonomy | Mission-driven planning + market tools | Digital India, Startup India, Atal Innovation Mission | Steady liberal turn since 1991 |
| Korea | Realist developmental → liberal-technocratic | Coordinated state–chaebol, open missions | 5th Basic S&T Plan, export incentives | Major shift late 1980s–2000s |
| China | Pragmatic realist, techno-nationalist | State-directed “megaproject” model | 14th FYP, *Made in China 2025*, mega-funds | Openness under tight control |

# Comparative Cases (2/2)

| Country | Development-philosophy orientation | STI governance approach (headline) | Key policy instruments / flagships | Historical shifts |
|---|---|---|---|---|
| Brazil | Import-substitution → partial liberal blend | State-bank-centered finance | BNDES innovation loans, EMBRAPII | Swing back to activist 2020s |
| Saudi Arabia | Petro-realist → techno-national Vision state | Top-down megaproject portfolio | Vision 2030 programs, NEOM, AI policy | Reform wave since 2016 |
| Ukraine | Sovereignty-first realism + open-source ingenuity | Crisis-innovation networks | Defense-tech drones, Diia digital state | War-driven 2022→ |
| Chile | Neo-liberal export base + emerging “network state” | Public–private green missions | Green $H_2$ Action Plan 2023-30, CORFO funds | Pivot 2020-present |

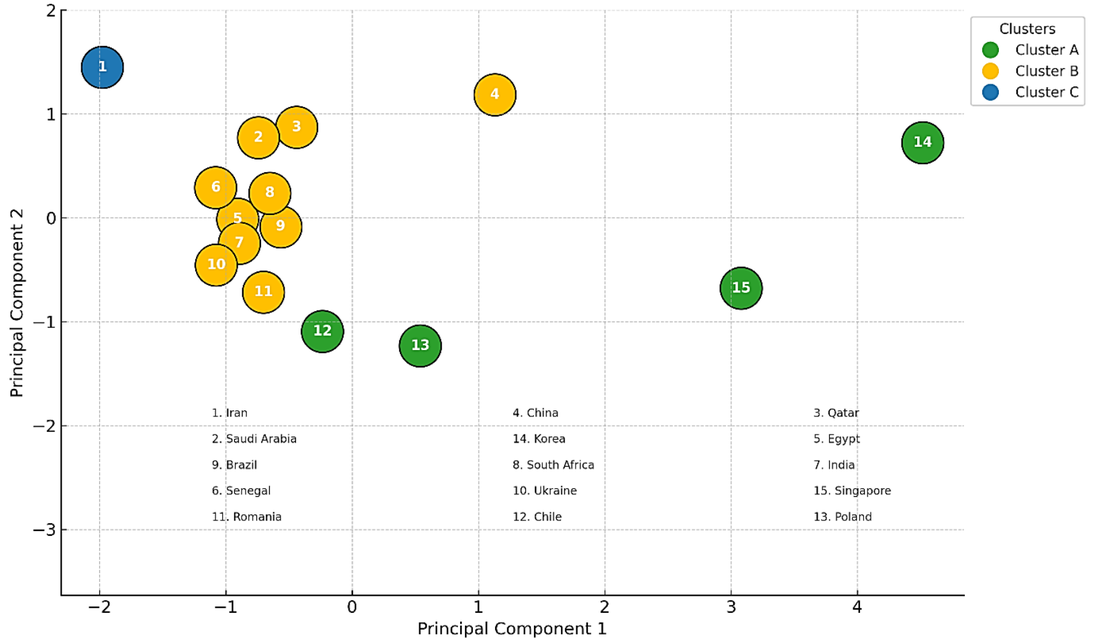
# Spectrum of Development Philosophies




This figure turns the comparison matrix into a quick visual scan. Each bubble shows where a country sits on the Realist → Liberal line, with colors shifting from yellow (strong realist) to deep green (strong liberal). The bold numbers inside the bubbles match the mini-legend just under the axis, so readers can find the country name in one second.

## Machine-Learning Check

- Techniques: **K-means** clustering + **PCA**
- Message: *STI Governance philosophy aligns with performance indicators (R&D, patents, institutions)*




- **Liberal systems**: steady funding, openness, accountability.
- **Hybrid systems**: need coordination to reconcile autonomy & collaboration.
- **Realist systems**: require multi-year budgets, audits, and wider stakeholder engagement.

## Policy Hints

**Korea (1980s):**

Moved from realist (state-controlled, closed) to liberal (open, export-oriented, collaborative).

**illustrate ideology shift → innovation boom.**

**Ukraine:**

Crisis-driven innovation where war forced a compression of cycles, and also forced a rapid adaptation..

**crises as accelerators → compressed innovation cycles**

*"These cases prove that philosophy is not destiny and may evolve over time, the STI governance approaches can recalibrate"*

# Global South Landscape

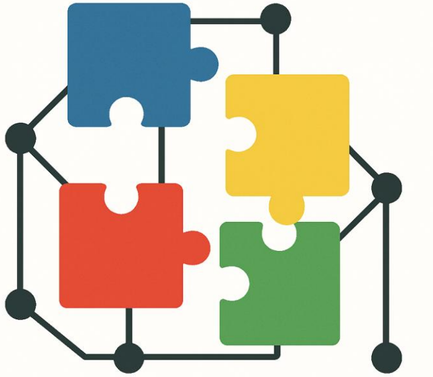
**Global South** : mostly hybrids and pragmatic realists.

- **Shared challenges**: fragmentation, volatility, limited trust (due to the limited involvement of stakeholders)
- **Shared strengths**: fiscal resources, large markets, geopolitical influence

- **Common global challenges (that all nations are struggling with):** Flexibility, Coherence

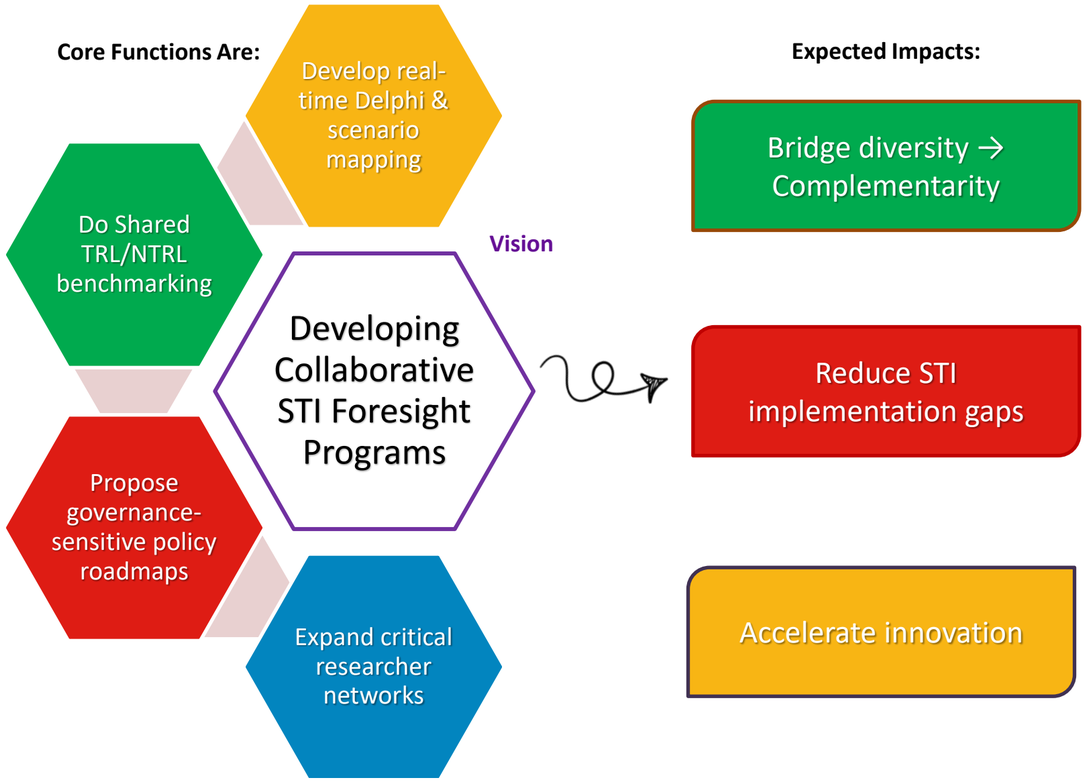
## The Opportunity

- Convert STI governance philosophical diversity → innovation complementarity.
- Turn fragmented STI strategies into shared roadmaps.
- Build trust across different orientations.



"Development philosophy is a hidden driver of STI performance. But through shared foresight, developing nations can overcome divides and accelerate innovation."

# Turning Diversity into Foresight Power



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