ICRIER WORKSHOP ON TECHNOLOGY

TECHNOLOGY POLICY
AND
NATIONAL INTEREST

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DRIVERS FOR TECHNOLOGY DEVELOPMENT

PUBLIC GOOD

Welfare /Agriculture / Health / Education / Industry /
Infrastructure / Atomic Energy / Space technology

NATIONAL SECURITY

Ammunition / Armament / Guns / Tanks /
Aircraft / Ships / Radars / Missiles / Electronic Warfare
Communication / Information / Nuclear Deterrence
New Concept Weapons

ECONOMIC COMPETITIVENESS

Productivity / New Techniques / Innovation / Efficiency
Automation / Management / Technical Services / Global Perspective

SUSTAINABLE DEVELOPMENT

Energy / Environment / Water / Food / Space.
New Concerns – Global Warming / Spread of Diseases /
Disaster Warning & Management.

DEMAND PULL OR TECHNOLOGY PUSH ?

Technology Development in India has been need-based for decades.
Therefore India has largely remained a Buyer of Technology,
limited by its resources & the various Technology Control Regimes.

Technologically advanced nations have secured higher level of security
and stability while several parts of developing world are still faced
with serious regional conflicts and threat of War.

Maintaining technological superiority over other nations, including
friendly nations, continues to be an important aspect of Foreign Policy
to safeguard National Interests - for most sovereign nations.

Technology Environment is now changing with Private Sectors
Playing a major role and Government playing Facilitator/Negotiator role.
Hence Technology Controls are getting gradually diluted.

India's technology strengths in priority areas have to grow faster than the
International rate, so as to bridge the gap and catch-up with the world.

*A Proactive & Aggressive Technology Policy is a Must for the Nation,
to change over from Demand Pull to Technology Push.*

CHANGING ENVIRONMENT

Technology has become the Key Catalyst for Growth and Progress - much more than ever before.

Technology has also become essential component of National Security, Global Competitiveness and International Power Balance Equations.

Globalization driven by Technology & Innovation has created paradigm shifts in perceptions of Development & Security.

Perceptions of Security and Development are merging closer with technology as the 'Common Denominator'.

Diffusion of Technology is now integral to International Transactions. Hence, Competition & Cooperation must Co-Exist in Real Terms.

Emerging importance of Asian block of Nations ("Developing Nations")
Asia in 2000 – Accounted for 60 % of World Population & 40 % of Global GDP
Asia by 2020 – 50% of Population & 60% of Global GDP (Estimated)

Science & Technology in INDIA

Since 1947, S&T enjoyed Political high priority for Welfare & Progress.
In the 1960, shifting priorities to Defence Technology became imperative.

First 3-4 decades saw significant contribution of S&T in Nation Building.
DST, CSIR, ISRO, DRDO & AEC became flag bearers of high technology.

Self Reliance in Important, Critical Technology has been a major focus.
But except for certain denied technologies, much remains to be done.

*Despite many pockets of Excellence, collective S&T performance
in India compares very poorly with advanced countries.*

Technology Performance of Indians world over in ICT field and
the steady promising Economic Progress of the past few years,
presents a window of unique opportunity for technology leap-ahead.

India must now take bold and confident steps to gain for itself
the rightful place in S&T ranking among the S&T leaders in the world.

Technology Policy for India

The 1958 'Scientific Policy Resolution' called for embracing, by all appropriate means, the cultivation of Science Research in all its aspects – pure, applied and educational'

The 1983 S&T Policy statement put emphasis on Self Reliance and Development of Indigenous Technologies, and stressed the importance of International Cooperation & Diffusion of Knowledge.

S&T Policy 2001was aimed at bringing focus on Revising administrative and management structures in S&T Departments & Institutions.

The 2003 Revised Policy re-emphasized the goal of Self Reliance and added focus on Sustainable development, Equitable distribution, and recognized the importance of knowledge based Development & Competition.

While IITs and some select Institutions have made significant contribution to S&T In the country, majority of University institutions have remained outside the main-stream of National Science & Technology Development.

In the absence of distinct National goals, policy implementation was largely driven by projects with varying levels of successes / failures.

CRITICAL AND FUTURISTIC TECHNOLGIES

Critical Technology	INDIA	CHINA	RUSSIA	EU/US/JAPAN
1. High Performance Computing	***	****	****	*****
2. Software Engineering	****	***	****	*****
3. Photonics	**	****	****	*****
4. Spintronics	*	---	***	*****
5. Superconductivity	**	**	****	*****
6. Biotechnology	**	**	***	*****
7. Nanotechnology	**	***	**	*****
8. High Power Lasers/ц-waves	**	***	****	*****
9. Composite Materials	***	****	****	*****
10. Data Fusion	***	***	****	*****
11. Simulation & Modeling	***	***	****	*****
12. Smart Material	**	**	***	*****
13. Miniature Turbines	**	***	****	*****
14. Space Technologies	***	****	*****	*****
15. Special Chemicals	****	***	****	*****
16. Herbal Products	****	****	***	*****
17. Stem Cell Research	***	***	***	*****
18. Climate Modeling	***	***	****	*****
19. Nuclear Technology	****	****	*****	*****
20. Renewable Energy Tech	***	***	****	****

"Technology & Security in the 21ˢᵗ Century"

The IT revolution has made the world more inter-dependent, with instant awareness and trans-nation reactions due to world-wide TV and Internet.

Advanced Computers, Space technologies, Precision Strike technologies and Network Centric capabilities have changed the complexion of war.

Perceptions of Security in the environment of techno-economic interdependence are changing the definition of the major threat as Asymmetric Forces & Weapons of Mass Disruption.

Concepts of proliferation and disarmament therefore need to be re-examined to evolve new approaches to ‘Prevent Future Misuse’ of technology and create a harmonious international technology climate.

Future solutions for ‘International Peace’ must be based on technology controls and technology sharing in a manner that can foster wider cooperation against common threats such as resource crunch, environmental degradation & global health risks.

TECHNOLOGY POLICY PERSPECTIVE

Present economic growth in India is predominantly fueled by technology and industrial know-how imported by Indian or foreign companies in India. There is very little Innovation or IP Generation happening within the country.

Developed countries continue to support innovation through grants to Stimulate R&D, basic research, new industries & 'disruptive' technologies.

Industries also embark upon new innovative R&D and creative techniques to create new products which provide them world leadership in markets.
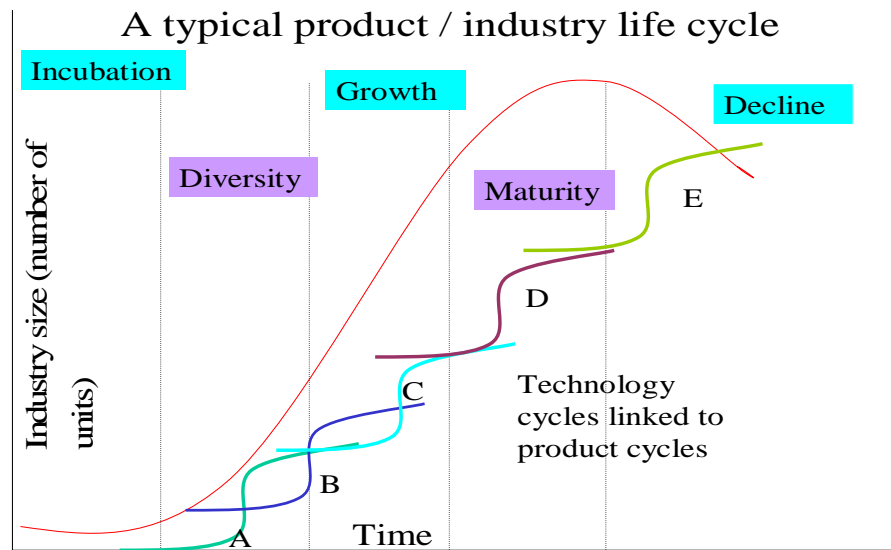
India currently uses a follower strategy which means innovation happens Elsewhere and India follows suit with a lag of about 8-10 years.

To reduce this lag, India needs an 'Innovation Ecosystem' that can link Markets, Companies, R&D Centres, VC – with a different value approach - of long-term focus on creating technology & not short-focus on ROI.

THIS CAN HAPPEN ONLY WITH A POLICY SUPPORTED and INSTITUTIONALLY DRIVEN NATIONAL INNOVATION SYSTEM

TECHNOLOGY PERSPECTIVE: ROLE OF INDUSTRY

A typical product / industry life cycle

Incubation

Growth

Decline

Diversity

Maturity

E

D

Industry size (number of units)

C

Technology cycles linked to product cycles

B

A

Time

Indian Industries today are mostly governed by short-term perspective.

Hence low on Investments in R&D (>20% of budget) and high on dependence on Imports (> 85%)

Successful products create new Industries –These have typical life-cycle of – (A) Incubation – (B) Diversity – (C) Growth – (D) Maturity – (E) Decline.

Most Indian Industries are in Growth phase while Global Industries are at Maturity. Global industries need Indian market to avoid stagnation and postpone Decline. Indian industries need technology know-how to grow faster to catch-up.

Indian industries must go Global before Global industries buy them out. As Mature industries get into restructuring and consolidating, Indian companies must exploit the situation to reinforce competitive position in the global market.

WHAT IS MISSING

With the long history of import substitution and Licence Production, Indian R&D has never got involved in real cutting-edge technologies.

Indian Industry managed to gain momentum, largely due to globalization of Technology trade dictated by Market forces, finding very little value in the Indigenously developed technology.

Unlike China that has benefited hugely through Civil-Military Integration, Indian R&D in separate compartments has lost out on leveraging the Dual-use technologies for rapid technology progress in the country.

Indian Foreign Policy & Technology Priorities have remained unconnected. Most DV Country External Policies seek technology advantage for itself. There is hope that this will change with the US-India N Deal.

Universities & Research Institutions are often engrossed in narrow priorities for funds and recognition. Few PhDs from even IITs find takers in Industry.

Incentives for Talent & Innovations are in-adequate to retain the High-quality manpower in the country. Most high achievers excel abroad.

WHAT IS DESIRABLE

Technology Development is a long process – Foresight and Planning is Vital. Creating trained Scientific & Technical Manpower takes even longer!

A multi-pronged Technology Policy is needed to –

1) **Create indigenous Core-Competence in select critical technologies**

2) **Fund and Build robust S&T Infrastructure in priority areas for India**

3) **Ensure the right mix of Traditional & Modern technologies for India**

4) **Reward Innovation richly and identify 'Champions' for Technologies**

5) **Foster better integration between Government, Industry & Academia**

6) **Define 'National Technology Goals' & involve all stake-holders**

7) **Leverage International Cooperation for rapid bridging of Technology Gaps**

In addition, External Policy must support the 'Technology Awakening' by

- **Identifying and promoting cooperation with key countries who can help**
- **Promoting technology inflow through FDI and Licensing Contracts**
- **Creation of a 'National Technology Acquisition Fund' – (N-TAF)**
- **Encouraging Indian Diaspora to help India's access to knowledge network and India plug-in to joint-research with technology leaders.**
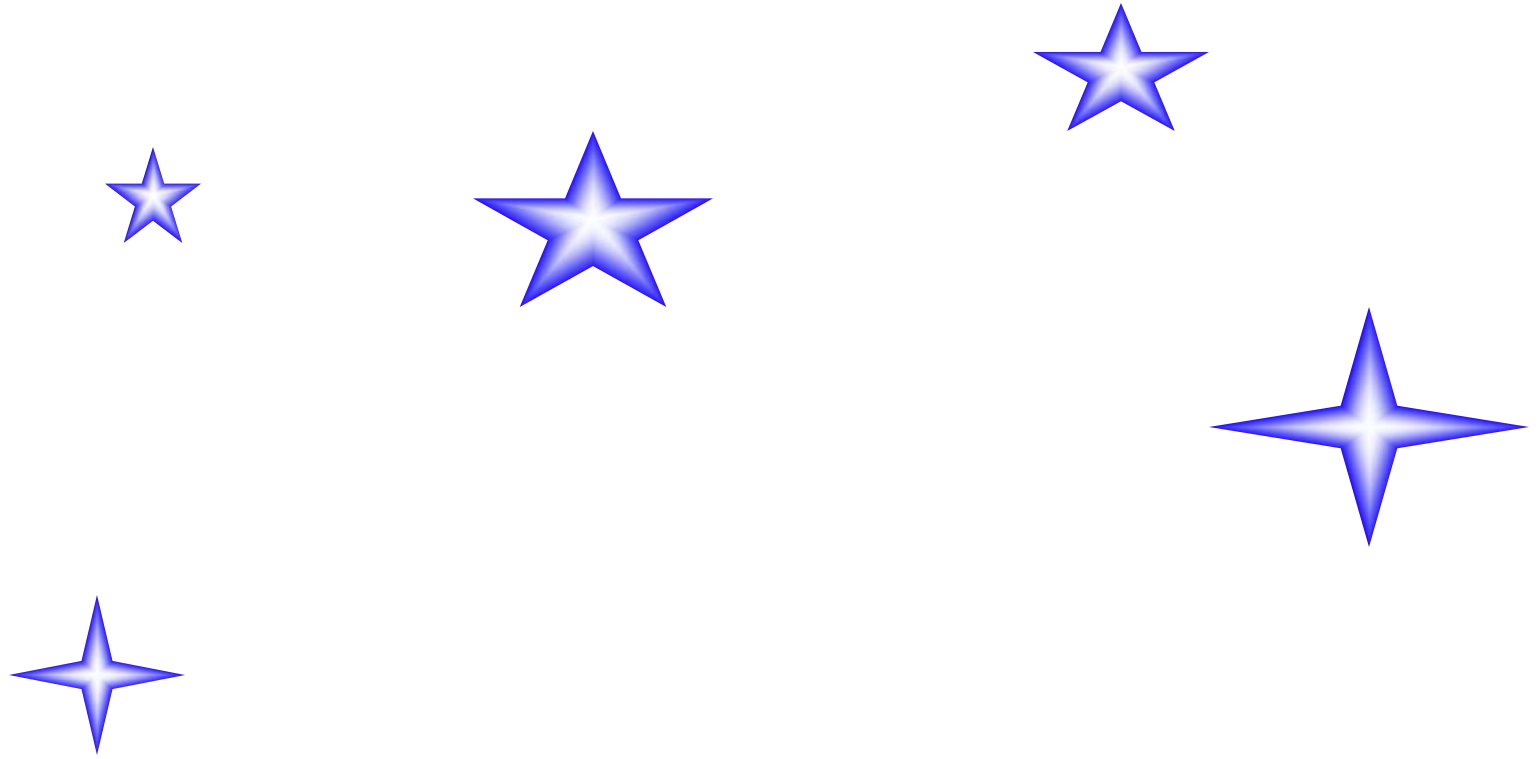
IN SUMMARY

**Race for pursuit of high-value technologies will get more acute in future.
Rising awareness about the advantages of advances in technology
and the promise of emerging technologies will accelerate the process.**

**Present Indian Economic success is riding on Market Forces
of large numbers and competitive cost of providing technical services.
There is no indigenous technology backbone for riding tough times.**
(Fortunately there are some exceptions in recent years)

**Business as Usual with incremental steps up the technology ladder
cannot make India a major player in International Technology field.**

**A top-down approach, based on where India wants to be in 2025,
should drive an aggressive Technology Policy & its Implementation.
This should be matched with a bottom-up approach towards 'Innovation'.**

**An integrated approach is needed to blend the Technology Policy
with the priorities of Foreign Policy & National Security Interests.**

Thank You !