

# Deciphering Innovation Strategies from Indian Experience

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# Plan of Presentation

- ◆ Context: Key Objectives of Innovation Strategies
- ◆ Framework for Capturing India's Experience
- ◆ Evolution of Strategy: From 1947 to Present:- Quick overview
- ◆ Strategy Examples: New Technologies:
  - ◆ IT, Bio, Nano
- ◆ What have we learnt: Adopted Strategies for addressing the gaps

# Context & Key Feature

- ◆ Still highly stratified Society:
- ◆ ‘Urban’ : Part of Industrial socio- economic environment
- ◆ ‘Rural’: Marginalized to Industrial socio-economic environment

# Dual Innovation Strategy

◆ Since 1947:

Aim: GDP Growth & Industrialization

Continuous Refinement and  
Strengthening

Major Economic Policy Change: 1991

Action: Various concerned agencies

Target: City & Town “Middle Class”

◆ New Additional Focus

Aim: Inclusiveness

Creation of innovation eco-system  
**covering all.**

Including grassroots innovations &  
innovators

Action: National Innovation Council:  
Chaired by Prime Minister

Target: Rural: “Poor”

# Framework

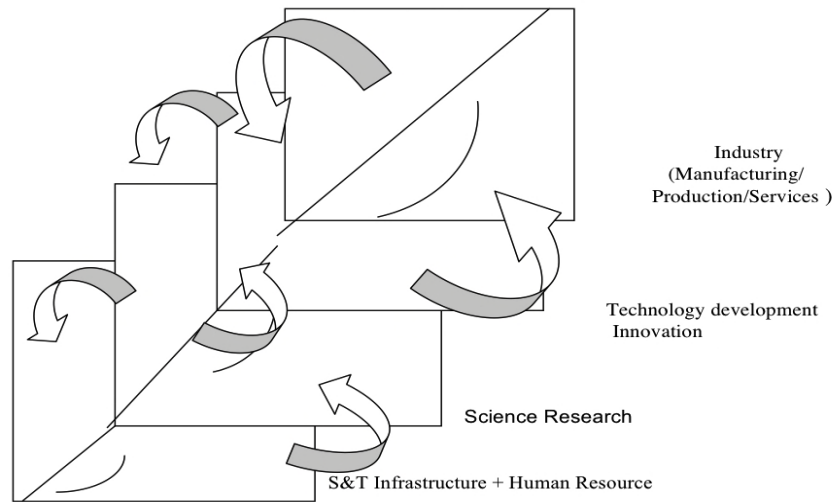


Fig. 2 S&T & Industry Trajectory (Adapted from: Niwa F. Tomizawah and

Linkages are Key for Innovation

# Trajectory: Quick Overview

- 1947 - 1960s: Infrastructure: Science, R&D, & Engineering  
Focus lower end: Establish R &D and academic institutions  
Within 20 years: 30 National Laboratories-all areas: CSIR ( like CONASYT)  
Prime Minister Nehru: President of CSIR Society  
Indian Institutes of Technology with US, Germany, USSR & UK collaboration  
Upper end : Heavy Industry, Chemical , Electrical , Steel  
Nehru – Industrialization Policy VS Gandhi- Rural Base  
Government Finance: Both: Industry and Small & Cottage ( Rural/Artisan )

## Second Period: 1960-80s

### **Reorient: Foreign Exchange Shortage: Food Shortage**

- ◆ For Food: Green revolution: Norman Borlaug ( Wheat)
- ◆ For Industry: Import Substitution: Use Indian R & D
- ◆ Protected Environment: Linkages: Chemicals, Pharma, etc ( Less investment for Change)
- ◆ R & D incentive to Industry: Tax waiver for R & D + 33%
- ◆ Result: Connect Lower to Upper end: Innovation Yes but Competitiveness missing
- ◆ Politically: Talk about Gandhi also: Cottage Industry & NGO's support to rural technologies ( Second Stream of S & T)

# 1980- onwards

## Move to Open Economy & Competitiveness

- ◆ Industry: Less protection from foreign firms

So look for innovations to stay in market: Local R & D less expensive therefore attractive

- ◆ R & D Laboratory: Mandate: Must earn to modernize
- ◆ Patent law changed to International practice
- ◆ Innovation and Competitiveness start building on S & T and Manpower structure plus accumulated enterprise experience



# Where did strategy take us?

## STRENGTHS in INNOVATION SYSTEM

- ◆ S & T Human Resource, R &D Labs, Corporate in-house R &D units, Universities, Engineering Colleges ...(For example in Bangalore- Indian Institute of Science, Tata Group supported , etc )
- ◆ R & D Funding : Total grows : Private share grows to 22%: Govt. 78%.
- ◆ Industry/Corporate Enterprise grows in some sectors
- ◆ Innovation linkages established between lower & upper ends  
i.e. corporate and economic players connect to R & D institutions  
( Still remaining Gaps and initiatives presented after IT, BT, Nano ).

# New Technologies: IT

## Example of Infosys: Growth of Software IT

1981: N. R. Narayana Murthy and six engineers start in Pune. Initial capital - US\$ 250. First client, Data Basics Corporation, New York. Shifts to Bangalore in 1983

1993: Employees Given Stock Options. Employee strength: 100, 000

1999: Moves up value chain: Packaged Applications for Enterprise. . Listed on NASDAQ: Becomes the 21st company in the world to achieve a CMM Level 5 certification. Opens offices in Germany, Sweden, Belgium, Australia, and two development centers in the US

Revenue grows to : US \$100, million.....

# IT & Innovation Strategy

**Software Sector grows: Mainly export led; How?**

**Strategic interventions: Initial hesitant attempts & reorientation**

Initial hesitant steps( First Phase)

- ◆ 1970's: Electronics as an emerging area
- ◆ Foreign exchange shortage: difficulties in hard ware imports;
- ◆ Thrust on R & D and strengthening & using indigenous capabilities
- ◆ Exit of IBM: Government led Demonstration of indigenous capabilities, e.g.
- ◆ Superfast Computer, Computer Maintenance Corporation (since called CMC)
- ◆ Slow spread of both hardware and applications
- ◆ 1980's : Reorientation: Push to computerization, Telecommunications and Computer Policy

# Reorientation: Second Phase platform for further growth

## 1. Telecommunication Strategy

- ◆ Telecommunication Mission: 1982: NRI Sam Pitroda joins from US
- ◆ 1984: Centre for Development of Telematics (CDAC) set-up
- ◆ Robust & rustic Rural Automatic Exchange developed (RAX)
- ◆ Telecommunication network expands :
- ◆ Support to Public Call Offices (Micro enterprises)-domestic usage expands
- ◆ State owned Intelsat System (Indian Satellite based stations) - international & domestic connectivity

## 2. Computer Strategy

- ◆ Computer Policy: Strategy: Make Software Business Attractive
- ◆ Liberalized hardware imports
- ◆ Duty & Tax incentives for Exports
- ◆ Software Technology Parks of India (STPI) 1991 : Autonomous Organization: Single window clearances, dedicated Satellite Stations and duty-free import , tax holiday
- ◆ Software Sector with relatively low capital investment, compared to manufacturing , utilizing manpower in India and abroad made it attractive for private enterprise
- ◆ GROWTH WITH PROFIT BECAME POSSIBLE

# IT : Impact of Strategy

- ◆ **STPI Grow : 6,329 in 13 Cities + Other Companies**  
**Medium & Small (relative: international IT companies)**

- ◆ Software Exports: From US\$ 400 million 1980 to 3, 700 in 1990
- ◆ 2 K Boom : NRIs join in, bring business & additional expertise
- ◆ Clusters in Pune & Bangalore (next slide)
- ◆ BPO's also grow ( not just call centers but other services too)
- ◆ Private players enter IT education/training : **Low infrastructure investment-** rapid expansion **to meet** enterprise needs
- ◆ Out-turn: In 2000 : 8% Master level- 5, 000 (PhD only 95) : 40% Bachelors Level- 27,000: 52% Diploma etc- 36,000
- ◆ Main driver of Software :Entrepreneurial innovative drive

# Emergence of Bangalore IT Cluster


Studies attribute this to the following major factors :

- ◆ Historical inheritance: Industry, Engineering Colleges, S&T environment in Academic institutions
- ◆ Large pool of NRI's from the region: bond of family and friends and good climate ( cool temperate) as attractions
- ◆ Several companies simultaneous come up utilizing Software Policy STP incentives.
- ◆ Bangalore suited the sort of technological externalities required for Software.
- ◆ International Alliances: Mainly non- equity strategic alliances ( capital not an issue) .
- ◆ Overseas Indians helped the firms to enjoy higher profits in exports (diversification of markets ); Quality certifications internal efforts

# Biotechnology

Building on Pharmaceutical Base

Compare to IT : Biotech: higher level R &D manpower & larger capital investment

- ◆ Strategy:
- ◆ Build on linkages between R & D and enterprise established during 80s.
- ◆ New R & D capabilities : Science & Engineering Research Council in 1985 started funding Biotechnology as a Thrust area for required 'higher' levels of manpower.
- ◆ Department of Biotechnology set-up ; promotes- first phase expansion of Biotech manpower and second phase, partnerships with companies.
- ◆ Strategic Measures 



# BT Policy/ Strategy

- ◆ First phase: Funding support to R &D and development of Human Resource started
- ◆ Second Phase: National Biotechnology Development Strategy 2008 (New Policy):
- ◆ Biotechnology Industry Partnership Program: 2008:
- ◆ Partnerships between R & D labs/academic institutions with existing enterprise engaged in Drug Development Manufacturing: 50% cost by Government; 50% by Enterprise (DST)
- ◆ Early Stage funding for high risk innovative commercial product proposals and support late stage development of SME led by innovators (DBT)
- ◆ Biotechnology Industry R &D Development Assistance Council: As an 'innovation management agency' in biotechnology

# Biotech Industry Status

## Revenue:

US\$ 3 billion in 2009-10 up from  
US\$ 1 billion in 2007-08

Number of Companies : 215: : 50% in Health Care: 30% in  
Agriculture

<b>Sub-Sector</b>	<b>% of Total Revenue</b>	<b>%Export</b>	<b>% Domestic</b>
Bio Pharma	60%	58%	42%
Bio Services	30%	96%	4%
Bio Agri	7%	4%	96%
Bio Industrial	2%	7%	93%
Bio Informatics	1%	79%	21%

# Nano Technology

Sector requiring high capital & high level science & engineering

- ◆ Still at formative stage
- ◆ National Nano-science & Technology Initiative 2007 financially upgraded as Nano Mission ( DST).
- ◆ Funding of **basic research**: centers of excellence
- ◆ Establishing chain of shared expensive & sophisticated equipment facilities
- ◆ Funding of application oriented **R & D projects**
- ◆ Promote private public partnerships

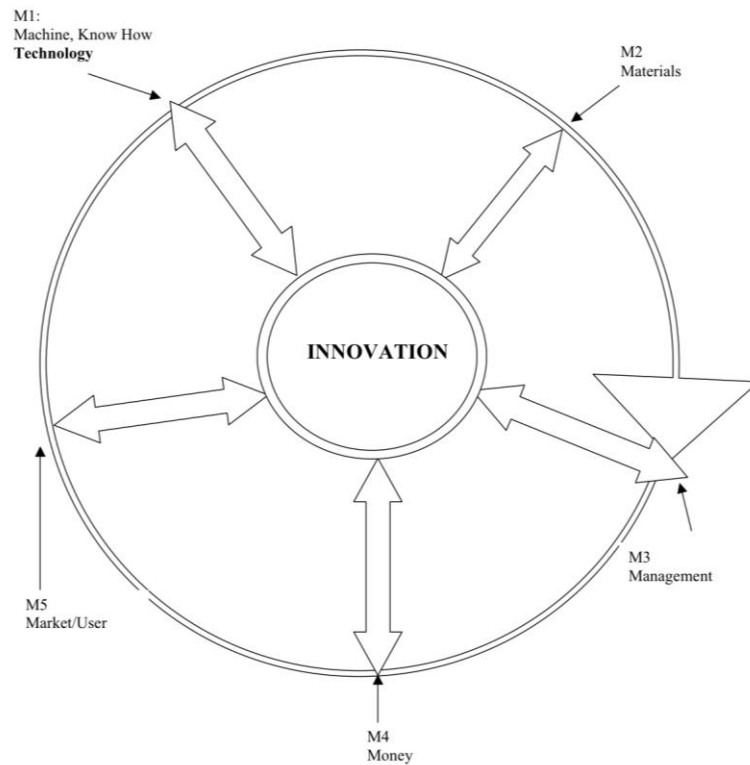
# Status

- ◆ Centers and Units for excellence in Nanotechnology: 10
- ◆ Papers in Nanotechnology (2000-09): 2629
- ◆ 289 : Patents application filed in Indian Patent Office and 144 abroad till early 2010
- ◆ Industries: 8 ( products with nano-materials)

# Summering Frame work

## Disaggregated View of Innovation

WHEEL OF INNOVATION



INNOVATION = Synchronization of Five Ms

# Summary

Differences in strategies based matching strengths with sector requirements

IT: - Basic Manpower existed. Software Sector : low capital and R &D requirement : Strategy: Create conditions for entrepreneurship & use NRIs to expand External Market linkages

BT: Manpower, capital investment, R &D and entrepreneurship existed in non-biotech Drugs, Pharmaceuticals, Agriculture & Health-care: Strategy: Create Biotech manpower, R&D and support enterprise linkages enabling enterprise to get into making biotech based products & services in their areas for domestic and international markets

Nano: Minimize deficiency in required higher level manpower, R&D and sophisticated engineering first (presently confined to strategic areas of Space, Defense and Atomic Energy)

# Gaps & New Initiatives

- ◆ Manpower: Expanding balanced growth of the human resource
- ◆ Gaps in technical skills: National Skill Council: PPP
- ◆ Gaps in PhD's and higher level numbers : Knowledge Commission and University expansion: facilitating foreign university and private sector partnership
- ◆ IT: Gap: Manufacturing: Launch of Special Economic Zones in Hyderabad, Bangalore, Pune, etc – the existing regions of manufacturing industry. Domestic market expansion through IT governance services
- ◆ Bio: Strengthening of regulatory frame work synchronizing cutting medical, agriculture, environment regulations.
- ◆ Nano: Strengthening of capacities in all segments sectors

# Gaps & Initiative's Continued

- ◆ National innovation Council
- ◆ Gap: Week Technology Innovation Parks: : Innovation Clusters for SME's, IT, BT etc in partnership with industry PPP in Universities, Publicly funded R & D labs management by Innovation Cluster Corporations
- ◆ Inclusive Growth enters Innovation Agenda: Traditional Knowledge Digital System, National innovation Foundation for Grass Roots becomes a New autonomous DST funded institution.
- ◆ Each state government has launched innovation strategies – deeper penetration (India is federal democratic structure)



# *End notes:*

- ◆ 1. Innovation related additional programs in sectors other than IT, BT, and Nano not covered
- ◆ 2. Data and references have not been given, but will be added later
- ◆ 3. In the absence of an articulated National Innovation Policy / Strategy, presentation is deciphered from several innovation strategies adopted by different agencies.

## LESSONS LEARNT

For Innovation Policy and Strategy:

1. Most important: Policy & Strategy Linkages between segments ( Science, R & D, Industry, Social Sector)

1. India's mistake: We did not recognize that

SCIENCE  $\neq$  TECHNOLOGY  $\neq$  INNOVATION

Akio Morita

(Legendary Chairman of Sony Corporation:  
Innovation Conference : Royal Society London)

Thank you for your attention

**GRACIAS POR INVITAR ME A ESTE  
IMPORTANTE EVENTO JORNADA y LA  
PERLA del PACIFICO**