

Technological Innovations

India's Performance and Global Standing

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INNOVATION TYPES

- Political Innovations
- Economic Innovations
- Social Innovations
- Technological Innovations

DEFINING INNOVATION

- A new process, product, idea or design which has proved and reached its intended target: Consumer, Market, Business, Society, Security. Normally expected to confer benefit to a vast segment rather than individual interest.
- An invention becomes an innovation only when it is utilized. Till then it is just an invention.(G. T)
-a process by which varying degrees of measurable value enhancement is planned and achieved in any commercial activity. This process may be breakthrough or incremental, and it may occur systematically in a company or sporadically.....(NKC)

INNOVATION DIMENSIONS

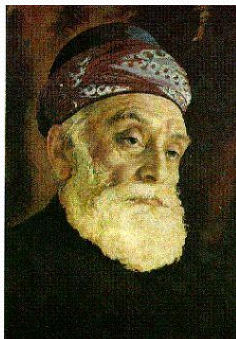
- Incremental Innovation
 - Continuous or discontinuous improvement in products in response to changing user needs such as design, quality, comfort, price, applications etc.
- Large System Innovation
 - Green, White, Blue, Brown Revolutions
 - Supercomputers
 - Teleknitting India
- Radical Breakthrough Innovation
 - Bell's telephone: Xerox, Polaroid, Supersonic Jets, Space Satellites, Space Vehicles, Antibiotics, Integrative Medicine, Designer Therapies, Mobile telephony

INNOVATION DRIVERS

- Visionary entrepreneurs
- Visionary scientists
- Charismatic political leaders
- Wartime demands
- Love
- Passion
- Denial regimes (“Yes, We Can”)
- National pride
- Consumer/market preferences
- Corporate rivalries
- Intellectual property incentives
- Recession

Dissatisfaction with status quo is a prime driver of innovation

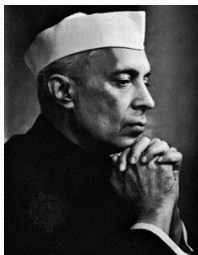
VISIONARY ENTREPRENEURS



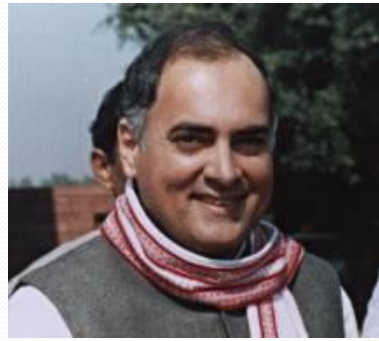
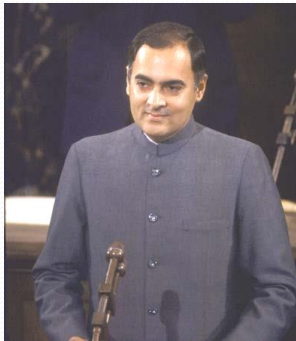
VISIONARY SCIENTISTS

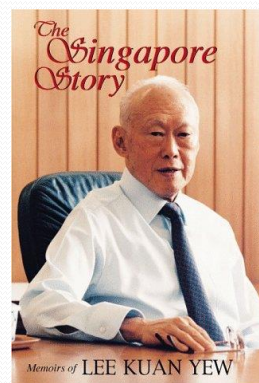
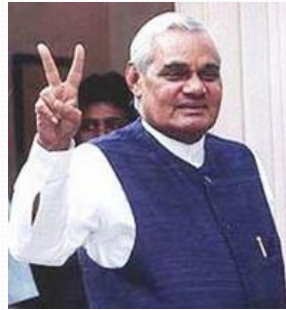
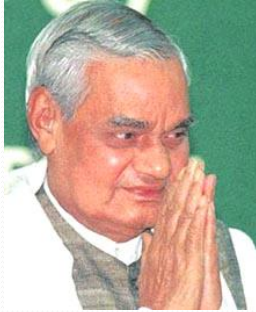


CHARISMATIC POLITICAL LEADERS



If I had the opportunity and competence, I would like to be a scientist in this laboratory rather than being the prime minister of India

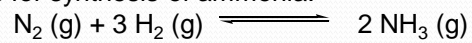




WARTIME DEMANDS



Haber process for synthesis of ammonia.

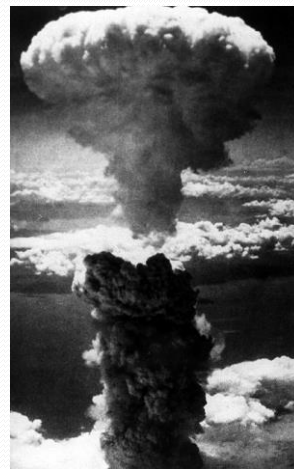


Synthetic oil-Fischer-Tropsch synthesis or synthine process
 $x\text{CO} + y\text{H}_2$

Mixture of hydrocarbons + water



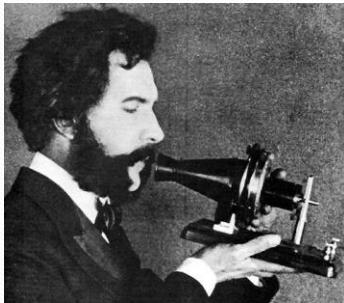
Extraordinary will, determination, and drive to
 mobilize an entire nation to resist an defeat
 aggression during world war II



LOVE



PASSION



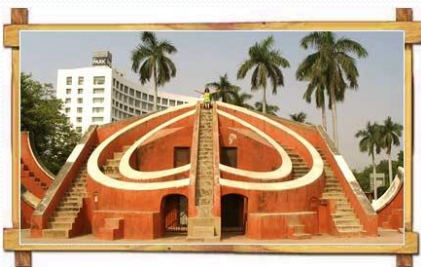
DENIAL REGIMES (“YES, WE CAN”)

- Super computers
- Cryogenics
- FBTR

NATIONAL PRIDE



“We choose to go to the moon”



NATIONS IN THE FOREFRONT OF INNOVATION

USA	Germany	Switzerland	France
Britain	Russia	Japan	Italy

How did these nations achieve?

- Because these nations consistently promote, support and protect the inventions and the innovators. Scientists and Innovators are eulogized in Russia, respected in Germany, honored in Britain and France and regarded as patriots in USA.
- All these nation foster independence of mind and expression.
- No muzzling. No hegemony.
- Science, innovation and economy are interlinked.
- Technology is integrated in foreign policy.
- These nations openly acknowledge that their wealth and economic stature derives from science and innovation. Their commitment to science based economic development is total and non-partisan.

INDIA

- Where do we stand as an innovation nation?
 - We are, like many other nations, highly successful in incremental innovation.
 - We have significant successes in system innovation.
 - We have not been successful in radical or breakthrough innovation---, not yet.
- What can we do?
 - Follow the USA model – the best there is – and make innovation a constant pursuit in every field. Encourage creativity right from school level. Equal opportunity irrespective of nationality, race, religion, faith.
- Are there signs of good hope?

High energy physics	Advanced computing
Space programs	Life sciences research



THE PHARMA SECTOR

- Kudos for developing a strong indigenous manufacturing base for this industry
- But, excessive infatuation with generics. May be good for shareholders but not good for India's external image. We are seen as raiders and free riders. This tag does not befit a nation aspiring to become a knowledge super power.
- We do not count among the world's pharma greats. There is not a single drug of Indian origin in the top 25 best sellers in the world market.
- Vast scope exists to tap our rich plant biodiversity. Great minds and skills are available which should be mobilized for directed research on New Drug Discovery. Some of the recently established life sciences research enterprises offer hope.
- A culture of original research should prevail.
- CSIR 's Open Source Drug Discovery is an imaginative initiative. Bright chances, if pursued with vigor and care, bridging all the links in the innovation chain