# Innovation and Role of Start-ups to make India atma-nirbhar

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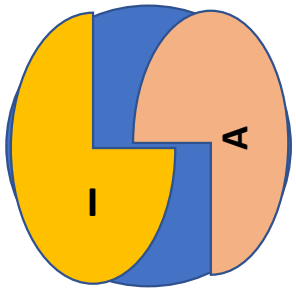
# Independent India built several high quality Educational S&T Institutions

- High Quality Institutions in India: IISc, IITs, IISERs, IICT …
  - Faculty came from the best institutions around the world
    - They are amongst best teachers, their students make a mark all over the world
    - Focus on basic R&D: significantly enhanced over the years
- But minimal Impact on industry in early days
  - Little Translation of R&D
  - Impact on industry therefore limited to getting trained manpower: more for manufacturing and management and less for R&D
- Indian Industry mostly imported technology know-how
  - Later significant Indigenisation for components carried out to reduce costs
- In last twenty-five years, many industries have their own R&D
  - but it is a replica of that in the West
  - they make a few breakthroughs, and occasionally some innovative designs and some software
    - It was able to leverage once in-a-while its low-cost manpower to do more

# Industry-Academia imbroglio

*No one to fill the gaps in industry-academia circle*




- It started in 80s
  - Industry believed that academia has very little to contribute to industry
    - Want to publish, does not understand products
  - Academia believed
    - Industry not interested in R&D - they only want to import proven technology
    - not interested in developing Innovative Technologies

- Breaking this stalemate
  - Academicians with a vison recognised that they needed to sell the vision to top management: not through R&D personnel
  - Need commitment to work with industry to do whatever required to get product to market
    - Industry-academia need to fully complement each other

# Today, industry-academia connect has begun

- For making a product more affordable in Indian context
  - Academia Licenses technology to established companies
  - Would often require efforts to convert into a product: manufacturable, 24 x 7, acceptable to customers, make money

- For highly innovative and risky ideas, academia look at incubated start-ups
  - Create new products: disrupt existing solutions / tech eco-system
  - When established company would not be ready to take risk and create market

# Collaboration towards Product Development

- Development of deep-technology Products: atma-nirbhar needs this focus
  - This is where the academia contribution is the most
  - No quick results – multiple failures followed by success
    - Requires long term engagement
  - Requires a large number of youngsters to be inspired to work hard
    - May simultaneously register for part-time MS / PHD
- Development of Software Applications
  - Low-hanging fruits
- Development of Software Products
  - Is tough and requires long-term collaboration: model similar to deep-tech R&D
  - Software companies which have excelled in India have focus on services, not on product development

# Internet, IT and Simulators enable early gains

- Electronic and Mechanical system design today considerably enabled by powerful simulators and software: youth can pick them up easily
- Areas where collaboration can build deep-tech Strengths in 2 to 4 years
  - Communications systems design, IoT systems
  - AI and Data Analytics
  - Robotic Systems
  - Battery Pack design
  - IC Design
  - Auto Sector and UAVs
  - Medical Instrumentation, remote diagnostics
  - Energy Systems Management
  - Motors and Controllers
  - Inverters
  - Education Technologies
  - Medical Technologies

*Complex and Large System Design: would take some time*

# More difficult as it requires large investment

- And longer time to Market for
  - Chemical and Processing Technologies
  - Material Technologies
  - Battery cell technologies
  - Solar cells
  - Pharmaceuticals etc.
- Will require Strong R&D to product commercialisation

- Here too Software and IoT may give some early gains

# Other Technologies Relevant to India

- Recycling Technologies
- Agriculture
- Food-processing
- Waste Disposal and Cleaning
  - less energy-intensive and less capital-intensive than used elsewhere
- Technologies for environmental-renewal
- Technologies to help highly-dense Urban Live
- Education and Health Care Technologies

# Making Products affordable: learn about India

- India is a country where per-capita incomes are very low
  - In spite of high growth over last thirty years
- Every Product and service have to be more affordable
  - than in the West
- How does one build low cost systems / products / service?