

# Vision 2035 ICT Report:

## Leadership in ICT: Towards Transforming India into a digitally empowered society and knowledge economy

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# Preamble

- Indians have contributed to ICT-driven economic growth in large parts of the world, **but less within India**
  - While ICT rules in sectors like banking and finance, its contribution in traditional sectors, making a difference to lives of its common people is the challenge
    - Need to Harness the tool to transform Agriculture, manage water, energy and other resources better, recycle water, sanitation-works to make India Clean, new kind of rural industry, provide meaningful and quality education and skilling, new kind of Governance
- India known for its ICT based services: deficient when it comes to **building ICT products**
  - Even while Indians lead design of most products, abilities to take products from conception to scaled market missing
    - **Start-ups, academia-industry** interaction may be the way
- ICT evolves at a furious pace: any ICT Vision exercise is likely to **fall too short** of what is achievable

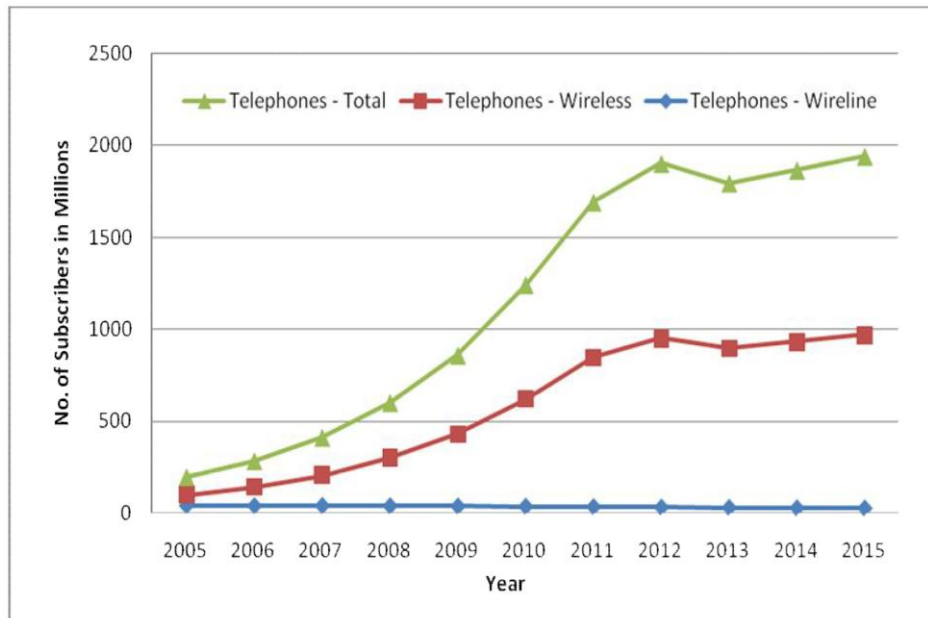
# Early period

- Early Electronics: Main costs associated with design, development, manufacturing **electronics hardware**; limited software effort
  - HW Costs plummeted with arrival of **IC (Moore's Law)**, **uP and DSPs** (programmable hardware usable in variety of applications). Design and development now increasingly constituted writing **new and complex software**
- 1970s: India took the first steps to establish itself as software power
  - young engineering graduates and entrepreneurs built a new industry in India: software services
  - Even though
    - **Telecom situation pathetic**: limited R&D, expensive systems, 8 year waiting for a phone; no innovation
    - Protected manufacturing for computers, radios and televisions: **very high-priced and old designs**
- Mid-80's
  - CDOT started changing this: assemble young bright engineers to take up this seemingly impossible challenge
    - trained Indians to carry out electronic design to production: taught manufacturing and business to a number of private players
    - Beginning of India becoming a Design house
  - **STD PCO policy and Opening up of electronics import** in late-80's helped
  - **Railway reservations** caught public attention and support
  - IT industry moved to sophisticated programming & designs: employed large numbers and integrated India
    - **Private engineering colleges** trained large number of people required
  - **JTG in five IITs** learnt and trained in Telecom (involved tier-2 colleges), started focusing on R&D

# 90s: Decade of acceleration

- 91 economic-policy and NTP-94 brought in telecom infrastructure, especially long-distance fibre links: helped IT industry immensely
  - **WLL** was produced in India: replacing copper wire with electronics
  - **Hundreds of companies** came up: Silicon valley Indians helped, constraint of early-stage venture funding
  - Telecom and VLSI design work became **sophisticated**: Indian companies and **MNC captives** mushroomed
  - Products were still missing as they still lacked financial backing and marketing outfits.
- Major **impact** in banking, finance and insurance: core-banking
  - Service extended to small towns and even some rural areas
  - ICT companies started building products for Indian needs addressing **difficult environment** (communication infrastructure, power break-downs, lower-affordability), tested in home-markets and started taking them to the world market
    - Today at a **stage where they can become product-leaders in the world**

# The turn of century



- Telecom reached most homes
  - even in rural areas
  - B2B and B2C money transfers, mobile payment, Bill-payment, Railway ticket booking, bus-ticket booking, cinema-ticket booking, Stock-trading, tax-payment, land-records company-filing and now UID and DBT, e-commerce (C2B) takes off
- Stage set for **E-governance**
- Electronic payment's traceability, powerful computing platforms and analytics software becoming a great weapon for **transparency and accountability**
- ICT and its cousin Internet have become an **engine to fuel growth**

## 2. Basic Technologies

- Solid State and Photonics
- VLSI Design
- Photonics
- Processors and Computers
- Quantum Computing
- Cloud Computing
- Robotics
- Artificial Intelligence
- Speech Technologies
- Decision, Control and Security
- Decentralised Solar-PV

## 3. Applications Areas

- Cyber-Security
- Telecom Sector
- Education
- Healthcare
- Banking
- Commerce
- Governance
- Energy and Smart-grids
- Transport
- Industry
- Agriculture
- Disaster Management
- Inclusive Society
- Image Processing, Media and Entertainment

# Recommendations: Looking Forward

- ICT has discovered how to **make products affordable**
  - Has learned to take its products **to anyone, anywhere and anytime**
  - ICT is now entering in **all aspects of human life**, in all products that a human being uses and in fact often transforming the products themselves
- *India is not that far behind the most developed countries in this sector as compared to that in others*
- ICT service industry amongst the best, including in design development and IPR creation that dominates value-creation of new products and services
- Goal to become a nation which **owns / develop products**: weak in this regard



# DIGITAL INDIA: *To transform a digitally empowered society and knowledge economy*

- Electronics and ICT needs to drive a large variety of applications
  - Need to do much more in **strengthening** Education, Healthcare, Transport, Governance, Energy Industry, Agriculture, Disaster Management and Electronics for Inclusive Society
- Not sufficiently dealt with in report
  - Electronics is transforming future automobile: **electric vehicles**, Electronically driven driverless vehicles, transforming aircrafts and avionics, Robotic flying objects carrying goods
  - Role of electronics and ICT in infrastructure provision and maintenance: **water-distribution system or monitoring the millions of renewable energy generators**
  - ICT in provision of physical security, monitoring and surveillance, driving defence technology, driving guidance and control of weapon systems
  - role of electronics and ICT in Governance, particularly in enhancing transparency and IT in livelihood and financial inclusion

# India's weakness today- Make in India Initiative

- Distinction between hardware and software is relics of its past
- India needs to strengthen its product industry: **Component and semiconductor industry will gravitate** where such products are developed
  - Has design and development capabilities
  - **one has to work out R&D strategy and from R&D to commercialization strategy and focus on IPR creation**
  - leverage home-advantage for early-trials and feedback
  - requires confidence, investments, ability to market in India and globally and **compete with the best anywhere**
  - Indian business-leaders to drive these products into market and build profitable ventures
  - Government policy must encourage such product-development and **remove all barriers that such industry encounters**

# State of India's IPR creation capability

- Indian **academia and R&D Institutes** are capable of creating IPRs
  - Small but growing number, **personnel in industry** who can participate.  
**Leadership is focused too much** on publishing papers
  - Needs **industry-academia linkages**: still tenuous
  - Need large R&D and IPR creation funds and **support for translational research**
- Need societies (like TSDSI) to debate and formulate draft standards for any product: **identifies gaps requiring IPR contributions**
  - commercial ventures making products need to negotiate with IPR-owners

# Incubators & Research Parks play a major role

- **NTTEDB and BIRAC** has set up university based incubators
  - Need to be **pushed for performance**: needs evaluation
  - Need sound investment system especially angel-investors
- University-associated **Research Parks** to take the industry-academia interaction to a new height

# Role of the Government and policy-makers: PMA

- enabling-environment
- tax regime sometimes favors an imported product rather than the one developed and manufactured locally
- inadequate and poorer infrastructure: adds x% to the cost
- finance charges on working capital in India between 12% to 16%
- Dumping from multinationals
- bias against Indian products: believed to be inferior in quality and costlier: deliberately exclude Indian products from their purchase decision

# Finally

- India can indeed harness the potential of ICT
- Needs leadership

# Add-on

# Value-add and Product-industry in India

- Design, Development and IPR (including software): India has the capability. It has to be harnessed by business. Government has to create the right environment
- Brought-out components and sub-systems: weak but is likely to develop as system production develops
- Packaging: started to emerge in India. NIDs producing young packaging design entrepreneurs
- Manufacturing (including assembly and testing): significant assembly industry has emerged. Financial dis-incentives needs for high-tech manufacturing needs to be attended to by Government
- Sales, marketing and commercialization