

Product Innovation – Idea to Impact

Stories and Learnings from Medical Technology Sector



- **Idea to impact**
Pathway and valleys of death
- **Success stories**
Smart stethoscope module
- **Behind the scene**
Running partner for innovators
- **Best practices**
Success stories & sustainability

Prof. B. Ravi, IIT Bombay

Mechanical Engineering Department | Desai Sethi School of Entrepreneurship
Biomedical Engineering and Technology Innovation Centre (BETIC)

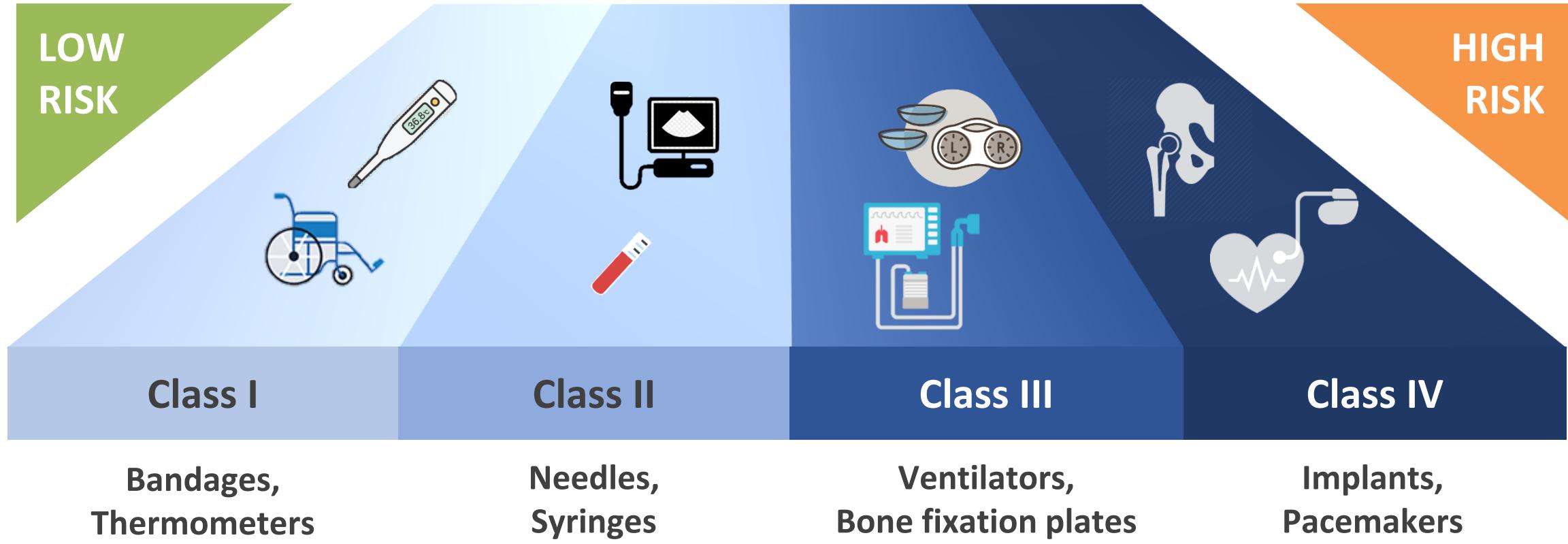
Healthcare Sector – Medical Devices

Indian healthcare sector:
(Hospitals, manufacturing, insurance, tourism)
5th largest employer (~5 million directly)
US\$ 372 billion in 2022
Healthcare expenditure:
India: \$ 70 | USA: \$ 7500 / head / y

Medical devices: Screening | Diagnosis |
Monitoring | Surgery | Treatment | Rehab
Indian medical device market:
Rs. 60,000 crore (US\$ 8 billion) / y
80% imported (Rs. 48,000 crore / y)



Healthcare Sector – Medical Devices

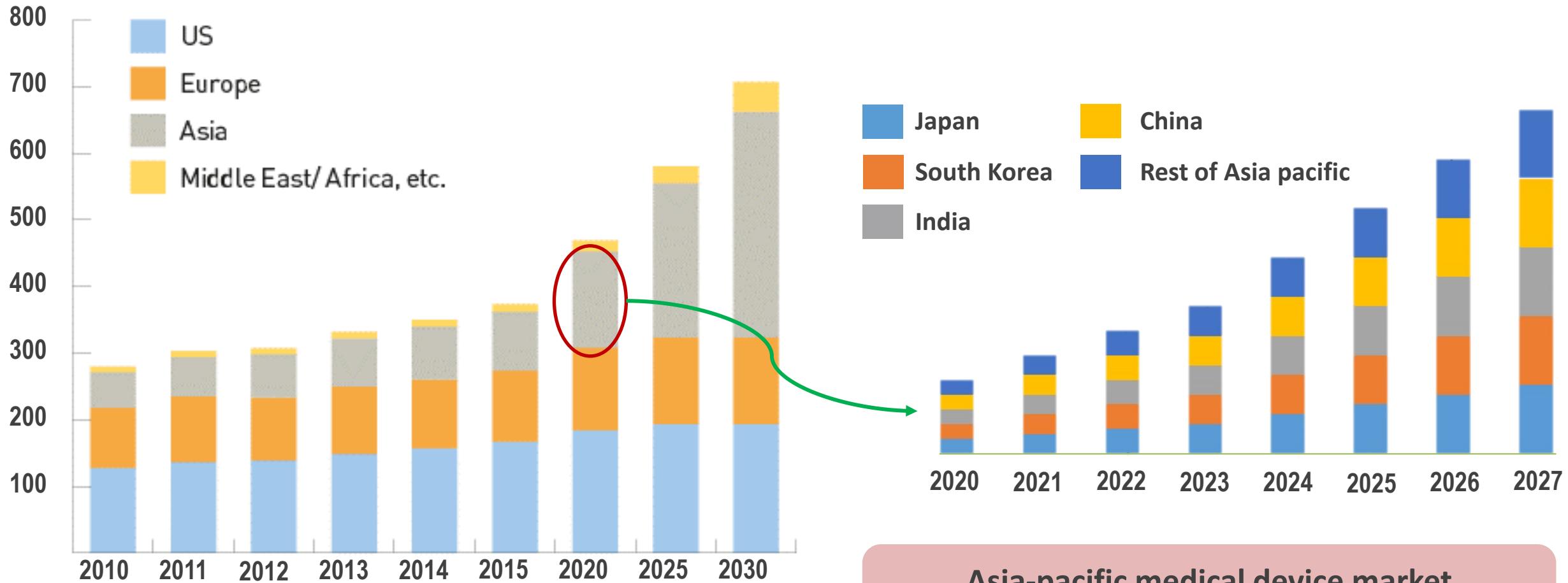


Criteria: Non-invasive or invasive? Short- or long- term? Passive or active? Non-critical or critical organ?

REGULATORY CONTROLS

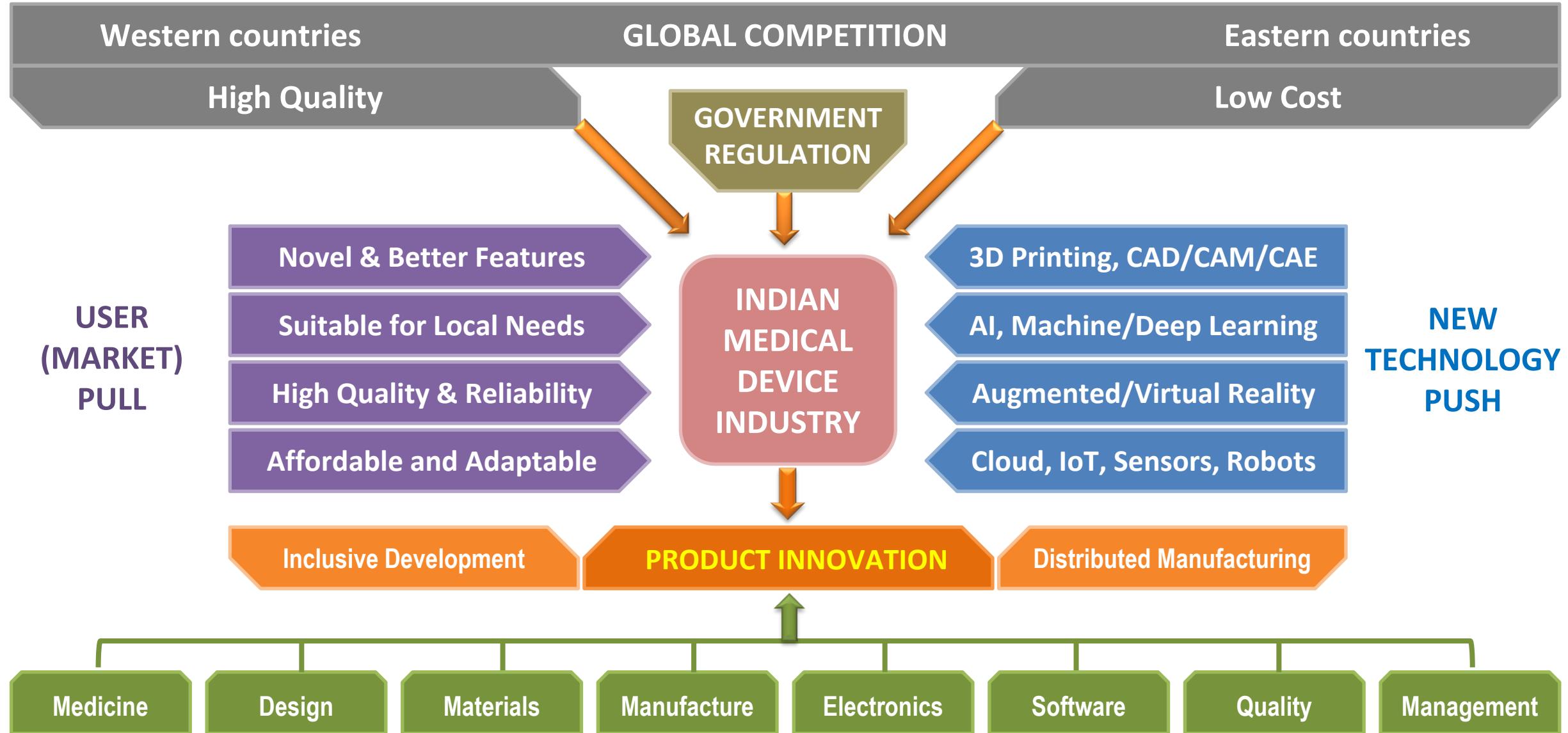
Medical Device Industry – Global & Asia

Billion US\$



Asia-pacific medical device market
~ USD 370 Billion by 2028

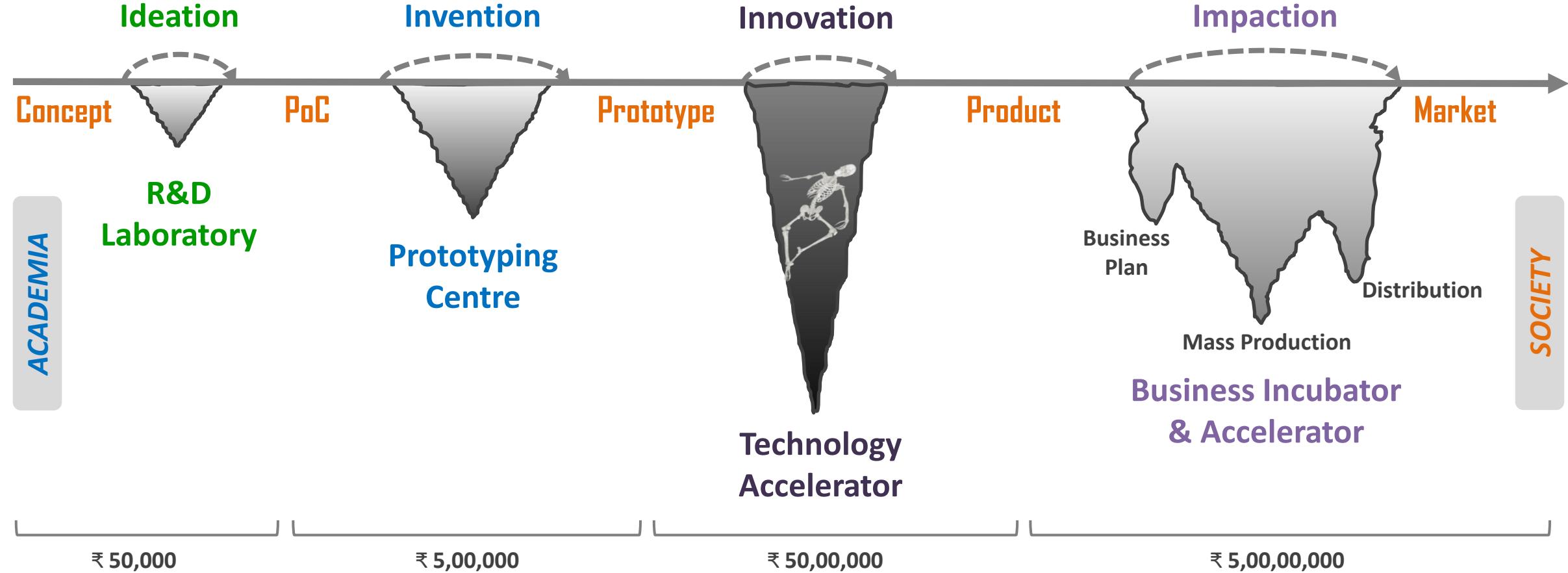
Medical Device Industry – Indian Landscape



Product Innovation—‘Valleys of Death’

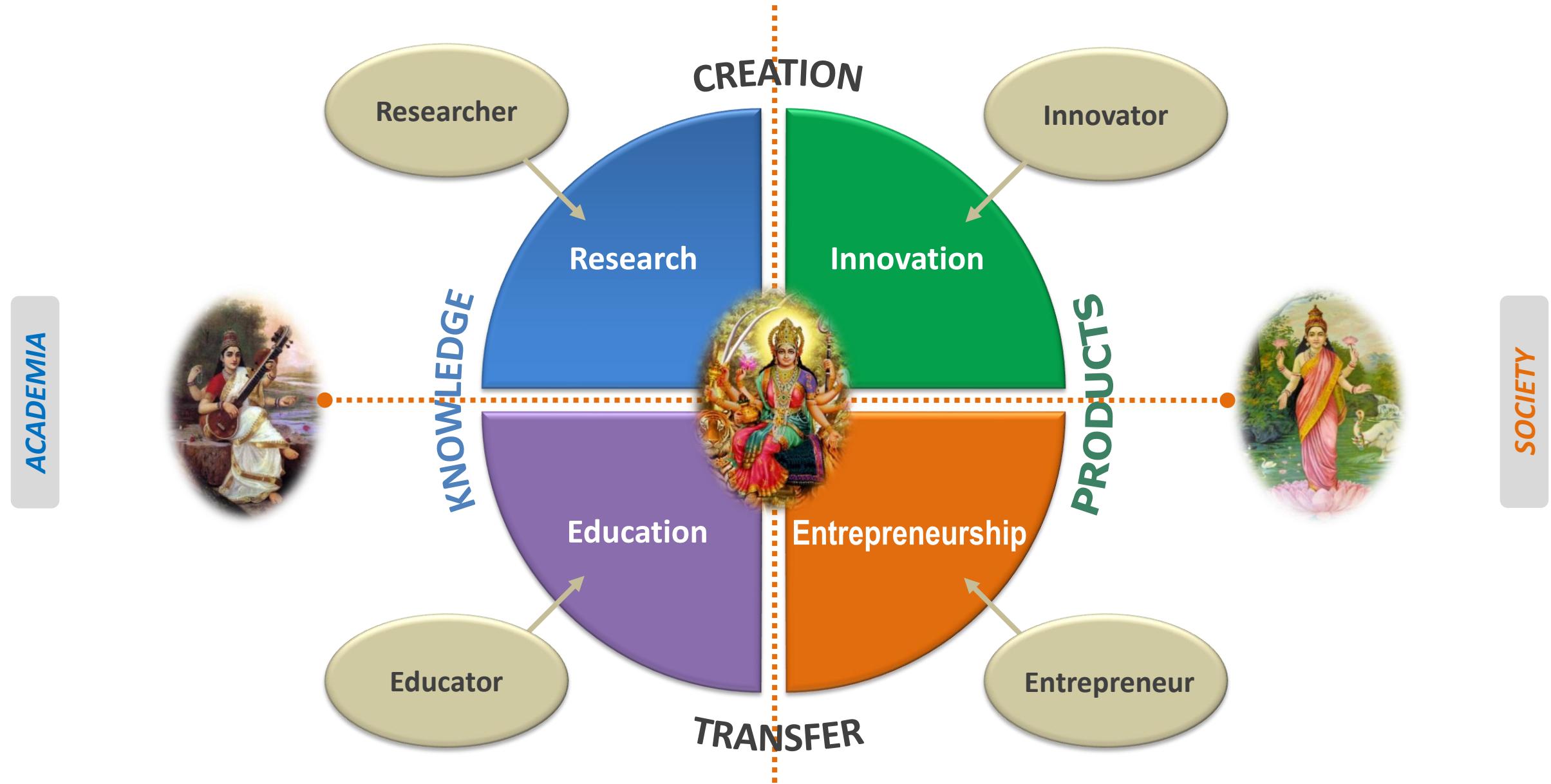


TRL 1 2 3 4 5 6 7 8 9 TRL



Critical Gap: Translation of research prototypes into marketable products

Product Innovation—‘R.E.INV.ENT’



Reflection Point



**Medical device innovation
should be initiated by:**

- (A) Anyone interested
- (B) Biomed engineers
- (C) Clinicians
- (D) Domain experts
- (E) Engineers
- (F) Financers

■ **Idea to impact**

Pathway and valleys of death

■ **Success stories**

Smart stethoscope module

■ **Behind the scene**

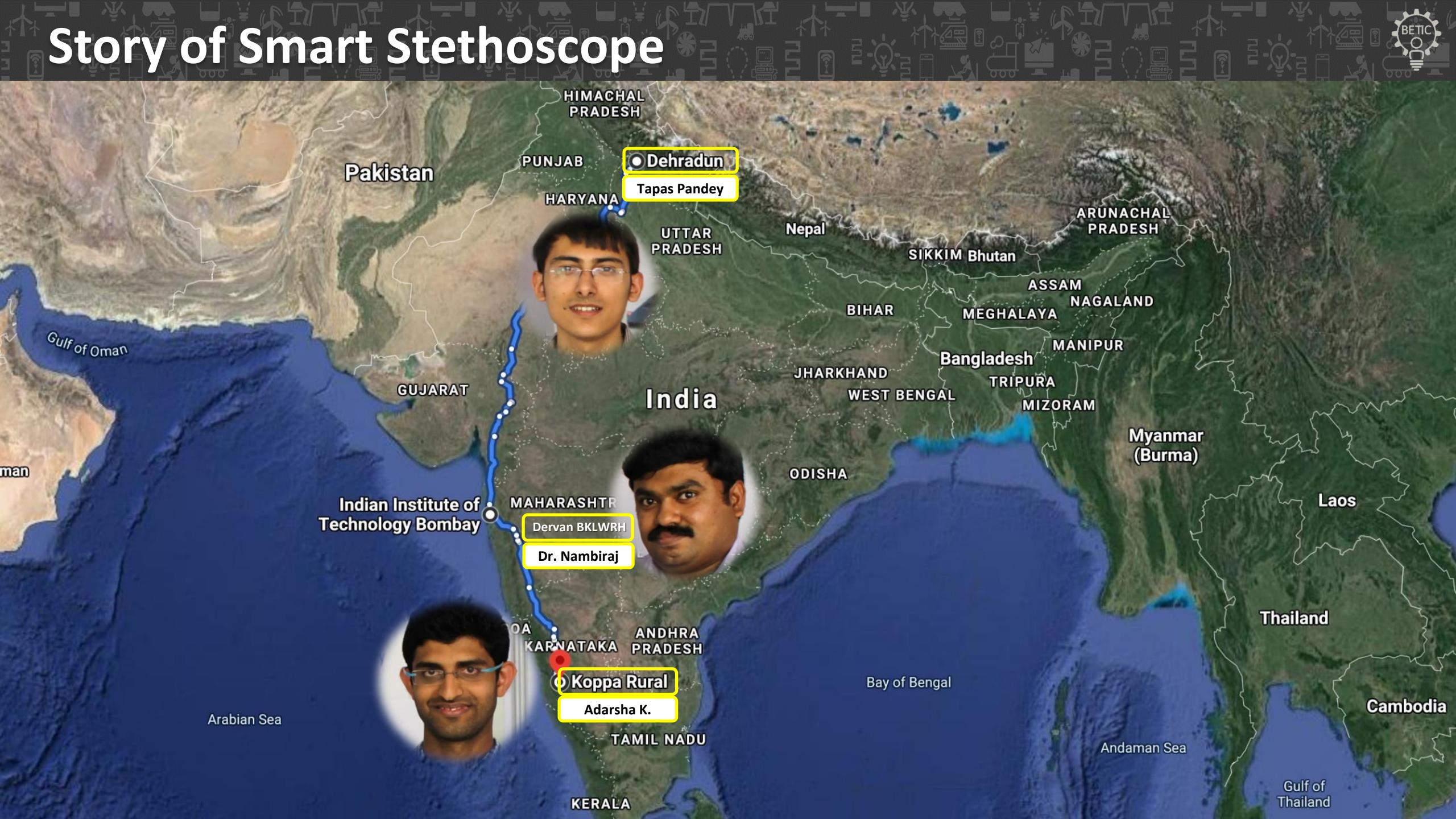
Running partner for innovators

■ **Best practices**

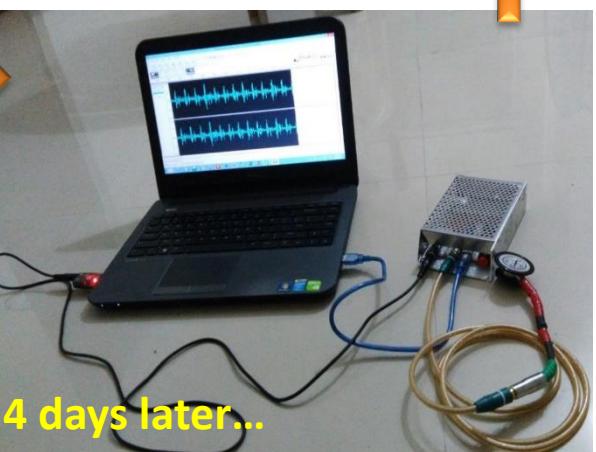
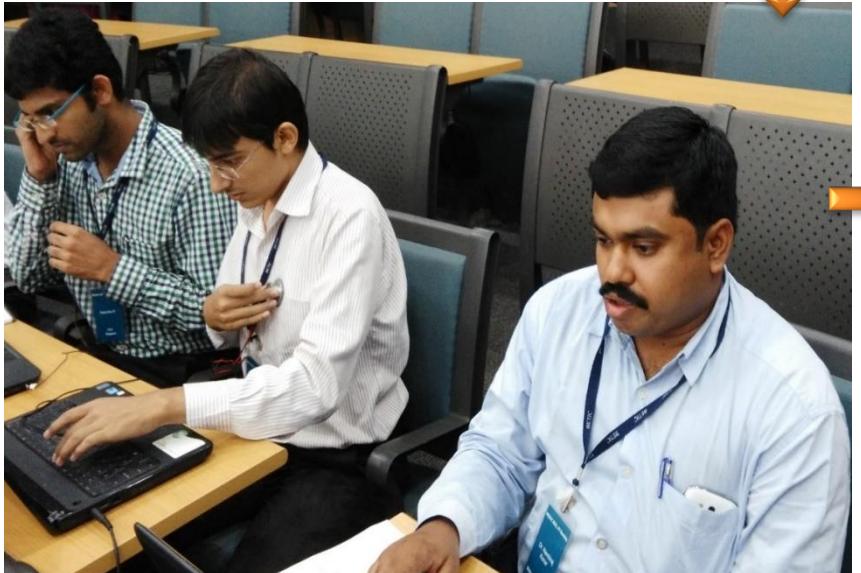
Success stories & sustainability

[Please type your choice or any other answer in the meeting chat box]

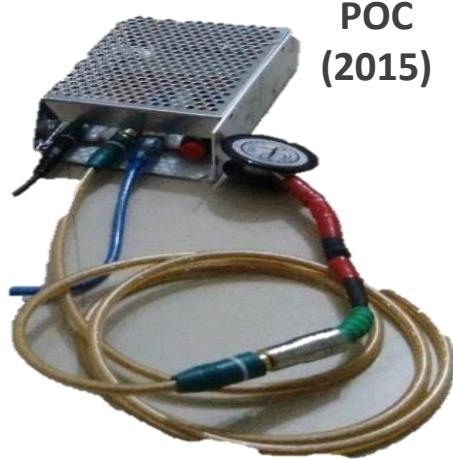
Story of Smart Stethoscope



Smart Stethoscope – Team



Smart Stethoscope – Product



POC
(2015)



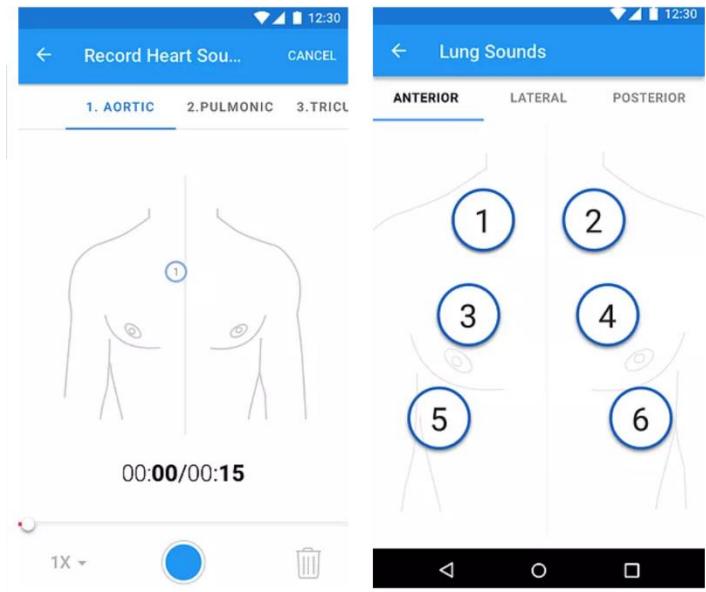
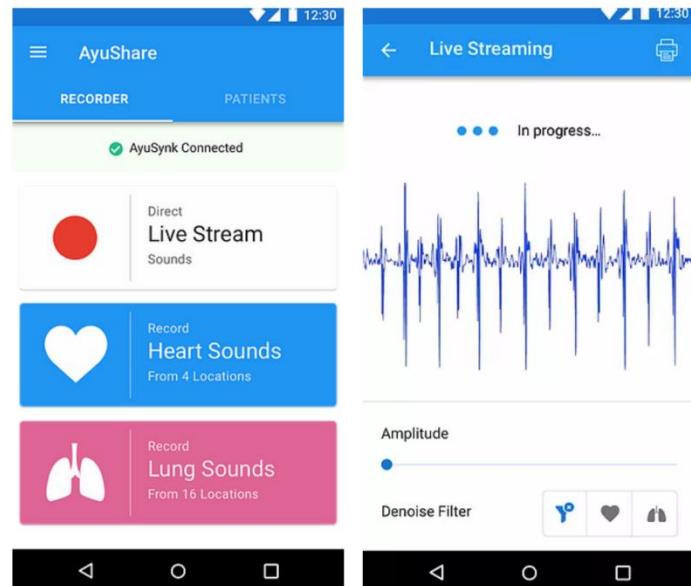
α Prototype
(2016)



β Prototype
(2017)



Product
(2018)



Software
(2019)

Smart Stethoscope – Funding

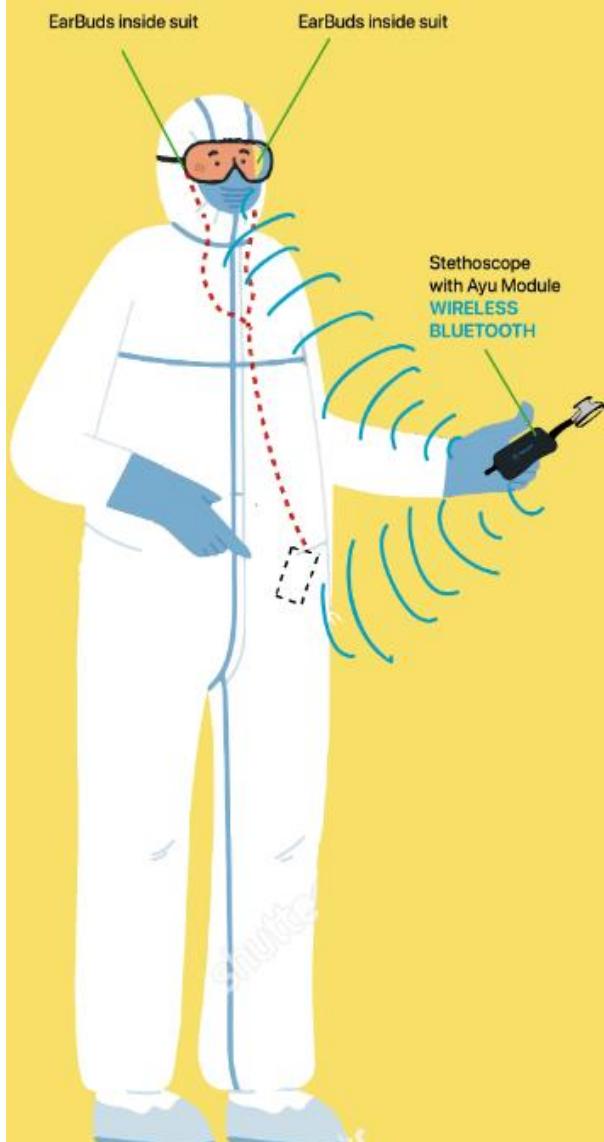
Indian Patent Filing

"A novel device which allows conventional auscultation as well as electronic recording, transmitting wireless information and simultaneous hearing by multiple users,"

201621029618, 30 Aug 2016



Smart Stethoscope – Pivoting



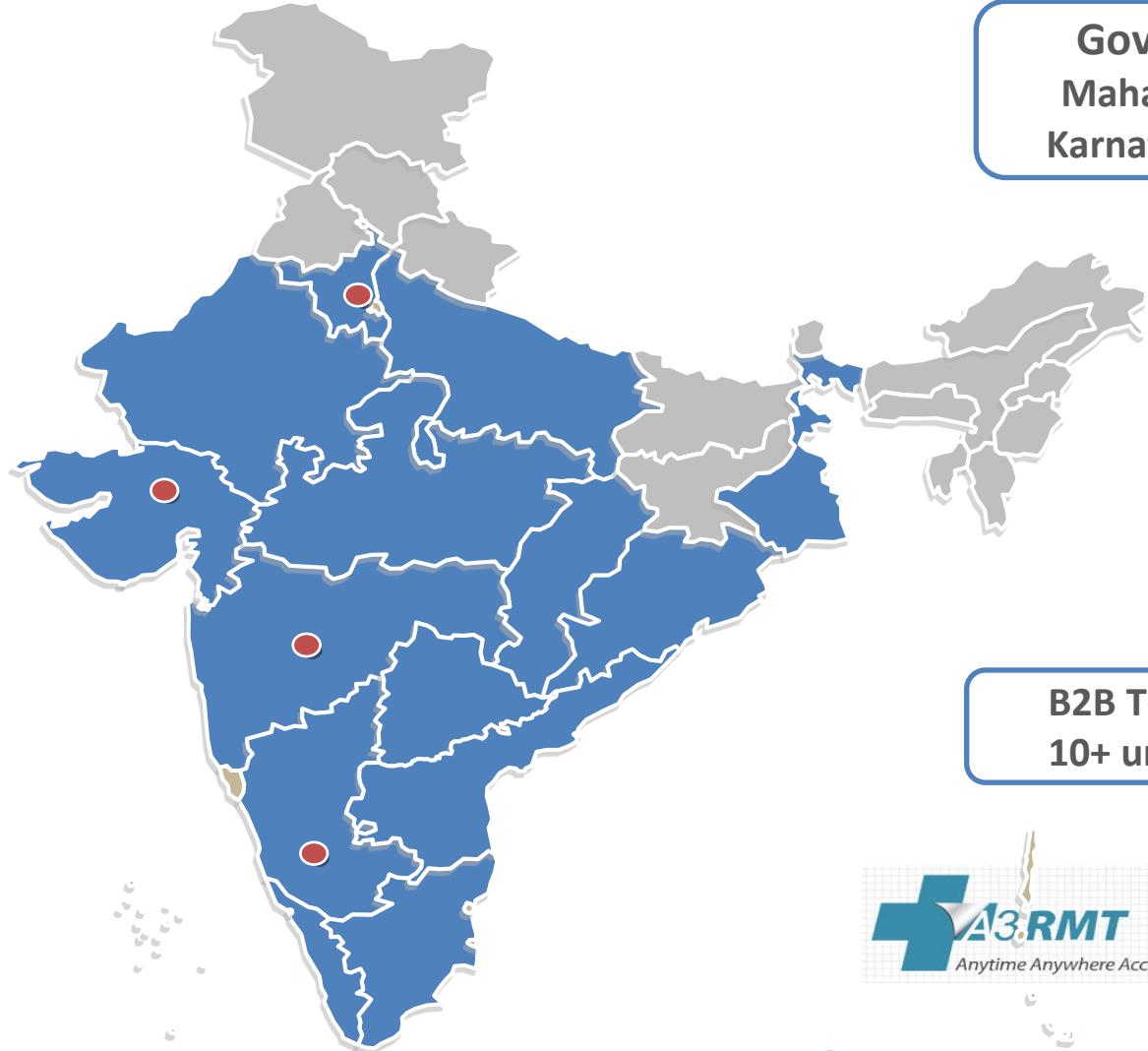
Hi Adarsh
Just read about your digital stethoscope in Newspapers.
I am Dr Alka Jadhav professor pediatrics at sion hospital.
I feel these stethoscopes will be of great help in COVID .
We will need atleast 5 or may be more.



Smart Stethoscope – Customers



~3000
units sold



Government PHCs
Maharashtra, Gujarat,
Karnataka, Bihar, UP, JK

B2B Telemed customers
10+ units sold/company



Smart Stethoscope – Media



Home / Special Report / Innovation Nation

The frugal innovators at IIT-Bombay

Housed in a small shed at IIT-B, the Biomedical Engineering and Technology (incubator) Centre, or BETiC, is nurturing medtech innovators to create low cost, yet high quality devices

BY VARSHA MEGHANI

PUBLISHED -

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Engineers Invent Low-Cost Digital Stethoscope For Better Village Healthcare!

The digital stethoscope is being commercialised by the startup Ayu Devices, with over 60 orders for the device. The startup is also focusing on bringing it to rural India.

by Ahmed Sherrif
May 03, 2018 107 pm

THE FREE PRESS JOURNAL SINCE 1928

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TRENDING NOW #NarendraModi #MumbaiRains #DonaldTrump #AtalBihariV

HOME / MUMBAI / MUMBAI, INDIA - RESEARCHERS DEVELOP STETH THAT CAN FILTER NOISES

Mumbai: IIT-B researchers develop steth that can filter noises

— By Dikshesh Sharma | May 03, 2018 09:31 am



Mumbai: The two researchers, Adarsha K and Tapas Pandey, and one Senior Executive Officer (SGO) of Biomedical Engineering and Technology incubation Centre (BETiC) at IIT Bombay, Dr Rupesh Ghyar

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A Forum of Opportunities & Collaborations Role of PSUs in Makin India Atma Nirbar

Government News / Latest Government News / Digital India

Coronavirus: IIT-Bombay develops 'Digital Stethoscope' for remote auscultation

The digital stethoscope, called AyuSynk, can be attached to any conventional stethoscope, to amplify chest sounds and send them wirelessly from patients to doctors without physical tubing.

LAUNCHED 2018

FOUNDERS Adarsha K and Tapas Pandey

INNOVATION Converting traditional stethoscopes into digital

An Indian rethinking of stethoscope suddenly finds relevance in covid-19 challenges

AyuSynk is a digital stethoscope developed by Ayu Devices, a start-up operating out of IIT Bombay technology business incubator, Society for Innovation and Entrepreneurship (SINE).



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Webinar on Microsoft SQL Server Licensing

Written by Anuj Bhata | New Delhi | Updated: April 10, 2020 12:50:46 pm

Invention

Webinar on Microsoft SQL Server Licensing

Sponsored by The Co...
A Interactive session exclusive
SQL Server 2016/2019 Licen
conducted on next week. Any
learn the basic and advance
Licensing can enroll on th
Webinar : 27th August 2020 T
PM-10:00PM IST Interested p
the...

CIALS PERSPECTIVE PIXTORY ENTERPRISE STRATEGY MARKETS CEST LA VIE EVENTS

mic 2018 / More than just a heartbeat | JUN 22, 2018



es' co-founders Adarsha K and Tapas Pandey

The ubiquitous stethoscope has a very long history. It was in 1816 when French physician René Laennec invented the device, partly driven by the fact that he was uncomfortable with the practice of doctors placing their ears on the chests of patients, especially women. Arthur Leared created a two ear piece binaural stethoscope in 1851, and the design was later perfected by George Cammann in 1852.

Story of the day
The Future Of Design – Ethereal Machines

Techtonic 2018

More Than Just A Heartbeat

Ayu's smart stethoscopes will help in spotting cardiac and pulmonary disorders early
Prathamesh Mulye

More From Techtonic 2018



Innovative Start-Ups – Part 3

edex LIVE

Published: 22nd May 2018

Invention

These engineers created an attachment that can make any stethoscope 'digital' instantly

Called AyuLynk, the attachment can detect and record heart and lung noises and digitally transmit them – making it a boon for health practitioners in India's isolated villages

Reflection Point



**What is the most critical factor
in med-tech success story:**

- (A) Large unmet need
- (B) Breakthrough idea
- (C) Committed team
- (D) Domain familiarity
- (E) Expert mentors
- (F) Facilities & Funds

■ **Idea to impact**

Pathway and valleys of death

■ **Success stories**

Smart stethoscope module

■ **Behind the scene**

Running partner for innovators

■ **Best practices**

Success stories & sustainability

[Please type your choice or any other answer in the meeting chat box]

Biomedical Engineering & Technology Innovation Centre



'Running Partner' for Med-Tech Innovators

Idea → Invention → Innovation → Impact



BETIC – Facility Development

IIT Bombay (2500 sq.ft, 5 locations)



COE Pune (2000 sq.ft)



VNIT (2000 sq.ft)



MGMIHS Sanpada (~1500 sq.ft)



BETIC – Innovation Process

I. Define (Doctor)



Team Building

Clinical Immersion

Problem Definition

Concept & Feasibility

II. Develop (Researcher)



Detailed Design

Virtual Prototype

Rapid Prototype

Functional Prototype

III. Deliver (Entrepreneur)



Pilot Manufacturing

Pre-Clinical Testing

Human Clinical Trials

Device Certification

IV. Deploy (Investor)



Intellectual Property

Business Model

Mass Production

Device Distribution

BETIC – Innovation Process



I. Define (Doctor)



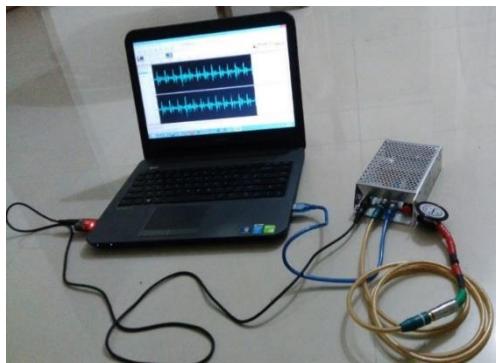
II. Develop (Researcher)



III. Deliver (Entrepreneur)



IV. Deploy (Investor)



Proof-of-Concept



Prototype



Product



Application

DEFINE – Field Immersion

- With prior permissions & consents
- Recording: Notes | Voice | Video

Focus: Devices used by clinicians

- Device selection among available options
- Procedure: Time | Skill | Variations

Observing the procedures:

- **Diagnosis:** recording symptoms, diagnostic measures, conclusion
- **Treatment:** surgery, rehabilitation, observing pain, discomfort, stress
- **Follow-up:** complications, remedies



DEFINE – Problem Statement



Well-defined unmet need is the first step in product innovation

Clear statement of user need in minimum words!

Rule 1: Must include what, why and who (need and target customer)

Rule 2: Must not be vague (else difficult to evolve or evaluate ideas)

Rule 3: Must not point to a solution (else radical new ideas get blocked)

Rule 4: Must go to root cause (else wrong problems get solved)

Example:

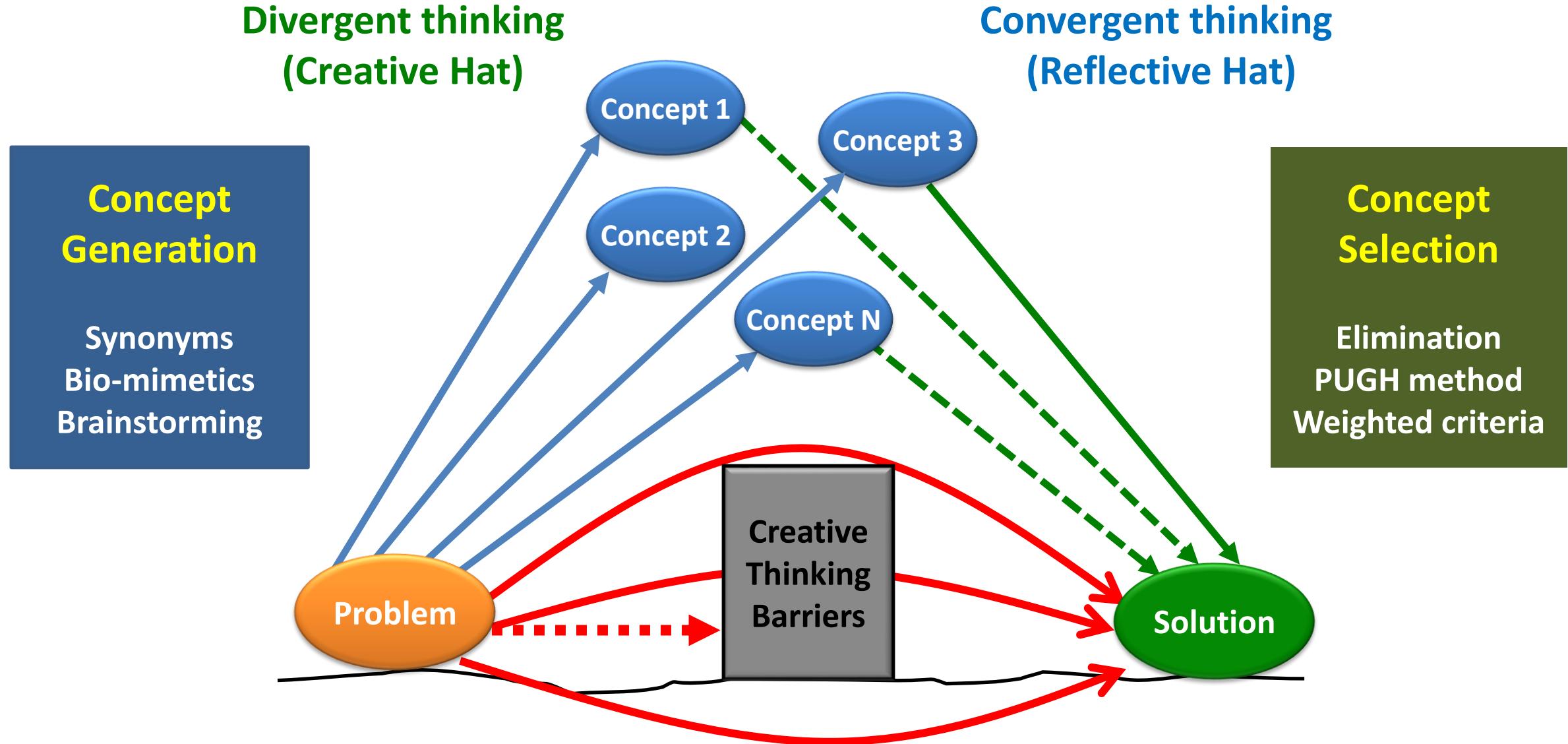
Portable cabinet what

to safely store medicines why

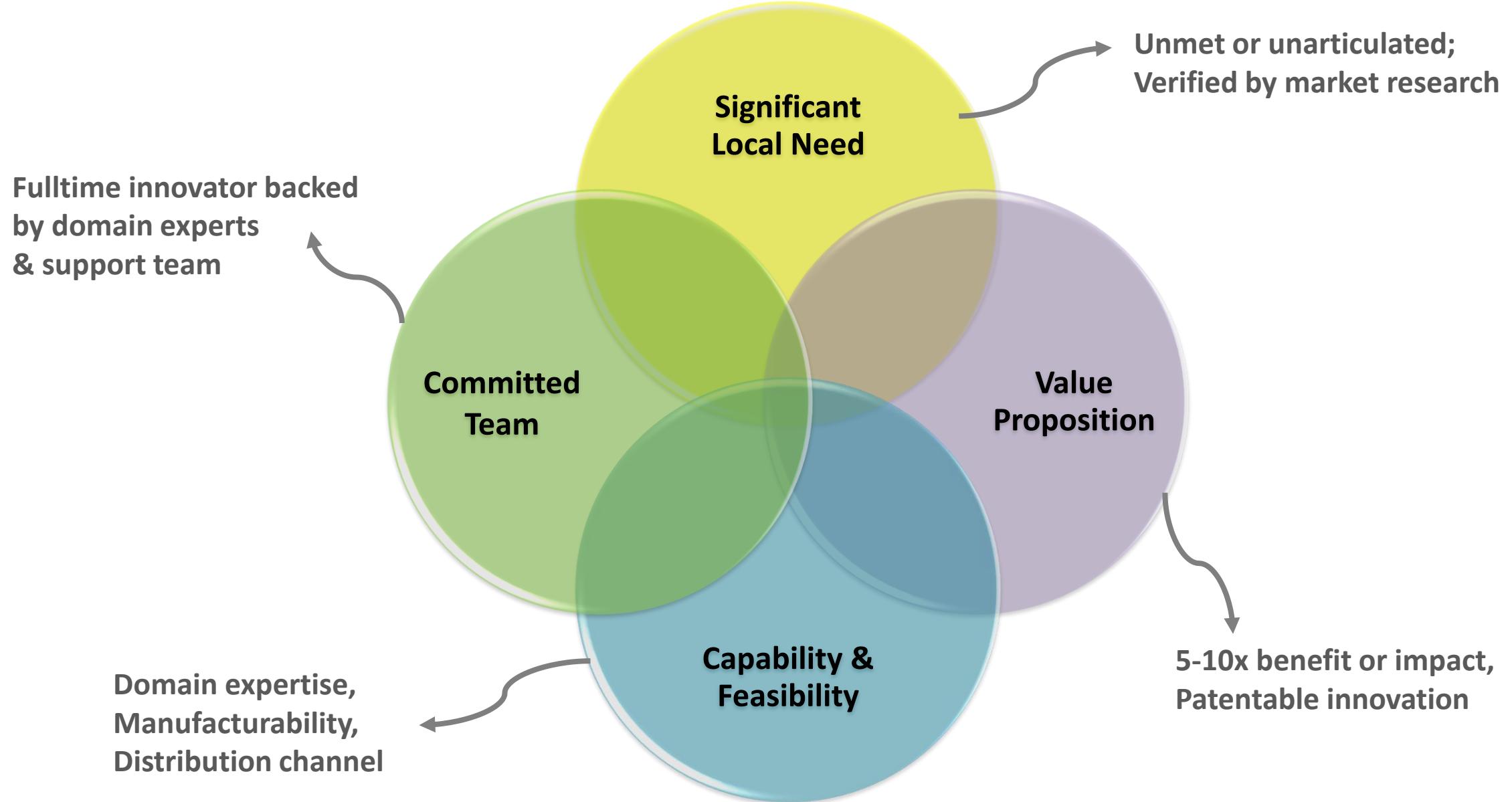
in rural hospitals



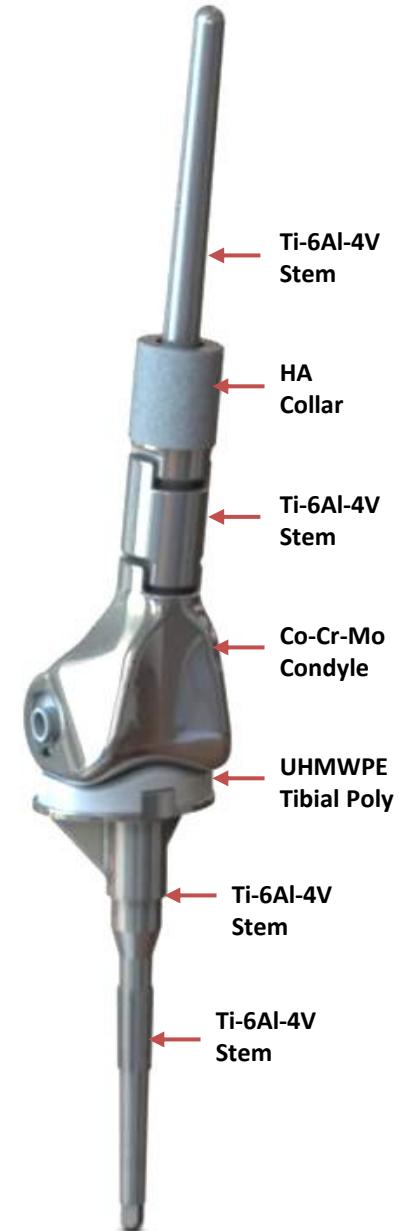
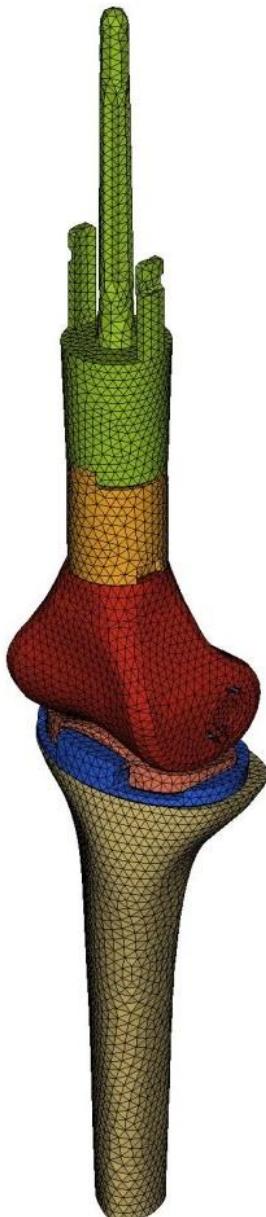
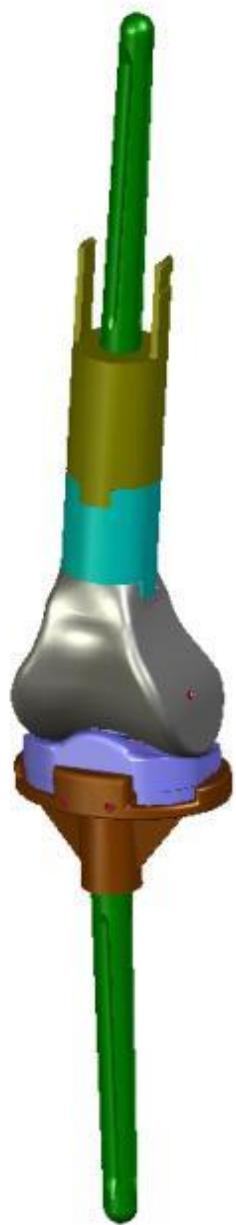
DEFINE – Concept Generation



DEFINE – Feasibility Checks

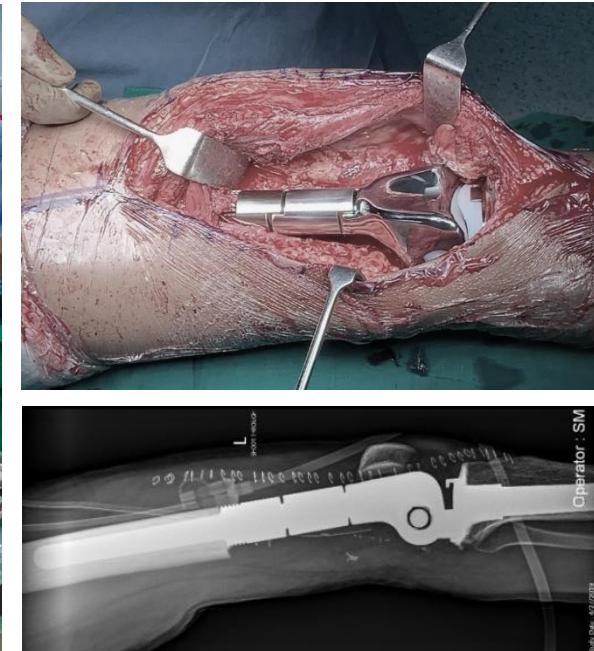


DEVELOP – Design, Prototype, Manufacture



DELIVER – Lab Testing, Clinical Trials, Certification

- **Lab Testing:** Establish ‘reasonable evidence of safety’ before human trials
- **Human clinical trials:** Prove safety, efficacy, accuracy (sensitivity, specificity)
- **Device certification:** Based on risk class (low, medium, high)



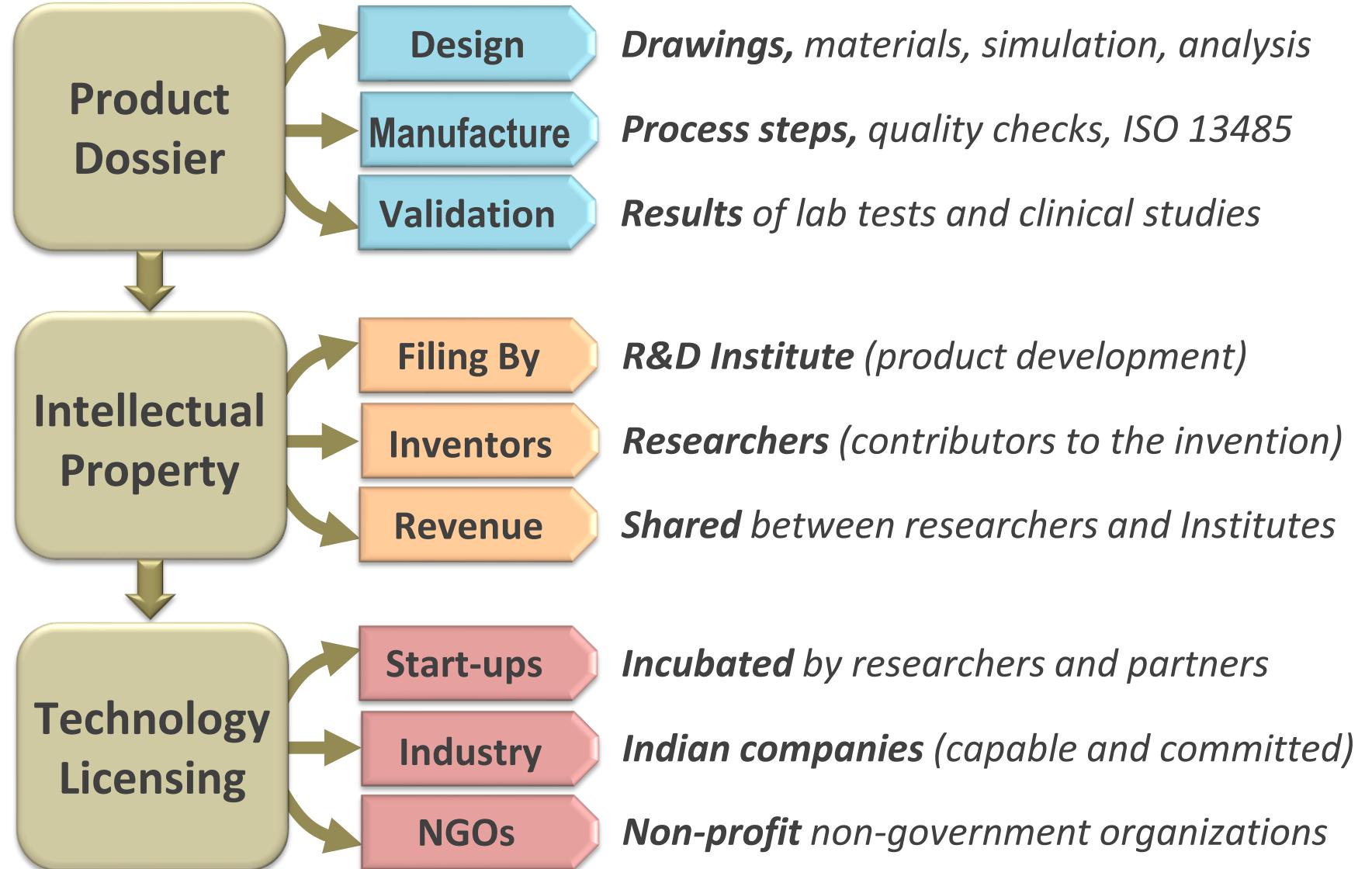
Biological Safety

Mechanical Safety

Electrical Safety

Device Efficacy

DEPLOY – Commercialization



Reflection Point



What is the ideal sector for med-tech startups :

- (A) Assistive devices
- (B) Basic screening devices
- (C) Customized implants
- (D) Diagnostic devices
- (E) Surgical equipment
- (F) Hospital equipment

- **Idea to impact**

Pathway and valleys of death

- **Success stories**

Smart stethoscope module

- **Behind the scene**

Running partner for innovators

- **Best practices**

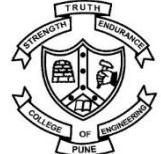
Success stories & sustainability

[Please type your choice or any other answer in the meeting chat box]

Medical Device Innovation – BETIC Network



IIT
Bombay



COE
Pune



VNIT
Nagpur



KJSCE
Mumbai



MIT-ADT
Pune



Symbiosis
Pune



GHRCE
Nagpur



GMC & JJH
Mumbai



HITRT
Mumbai



MGMIHS
Sanpada



BJMCH
Pune



DMIMS
Wardha



BKLWRH
Dervan

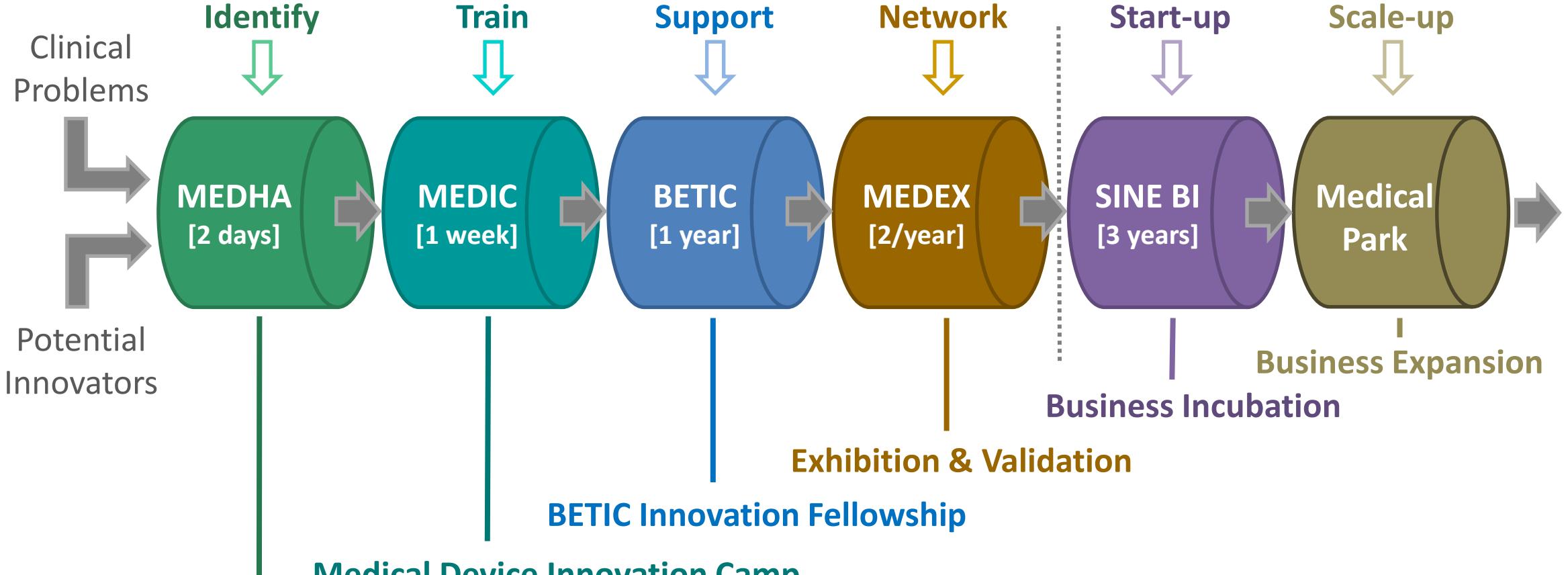
Main Partner Institutes (RGSTC-BETIC Centres)

Engineering Institute Partners (Self-supporting BETIC Cells)

Medical Institute Partners (Clinical inputs and validation of medical devices)



Medical Device Innovation – BETIC Pipeline



Bedside → Bench → Business → Bedside

Medical Device Hackathon – MEDHA



BIR, Nov 2016



Pune, July 2017



Mumbai, July 2017



Kolhapur, Aug 2017



Wardha, Aug 2017



Nagpur, July 2019



Mumbai, Aug 2018



Pune, July 2019



Nagpur, July 2019

Medical Device Innovation Camp – MEDIC



eMEDIC
2-24 Oct 2021
Pre-registration
10 Sep 2021



IIT Bombay, Sep 2015



VNIT Nagpur, Sep 2016



COE Pune, Sep 2017



IIT Bombay, Sep 2018



IIT Bombay, Sep 2019

Medical Device Innovation – BETIC Fellows



Medical Device Exhibitions – MEDEX & Other Events

MEDEX, BKLW Dervan, 2015



MEDEX, COE Pune, 2016



IITB, 2018



IISF, Delhi, 2015



IISF, Delhi, 2016



IISF, Chennai, 2017



IMDE Bangalore, 2017



MEDEX, IITB, 2018



Techfest, 2018



MEDEX, IITB, 2019



Medical Device Innovation – Products

BETIC STARTUP COMPANIES

Glaucoma screener
*(OKO Icare Solutions)**



Endotracheal block detector
(Atmen Technovention)



Smart stethoscope
*(Ayu Devices)**



Surgery planner
*(Algousurg Products)**



Hybrid splint
*(Medi Asha Technologies)**



Menstrual cup
(Care Form Labs)



Diabetic foot screener
*(Ayati Devices)**



Knee ankle foot orthosis
(Aumeesh Tech)



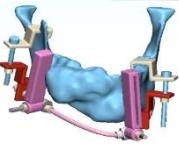
* In market



Patient-specific bone scaffold
*(DICUL AM)**



Centric jaw recorder
(Prosthocentric)



Mandible surgery guides
(Precisurge)



Flexible burr
(Aur Innovations)



Skin spray gun
(Pacify Medical)



Automatic Suturing
(Denovo Bioinnovations)

Burn patient isolation
(MedGyor)

INDUSTRY PARTNERS

OT recorder
(Prism Engineers)



Scalp cooling cap
(Curotherm)



Patient-specific implants
(Multiple customers)



Biopsy gun
(Tenon Meditech)



Electrochemo therapy
(Tenon Meditech)



Laparoscopy device
(Eclipse Instrumentation)



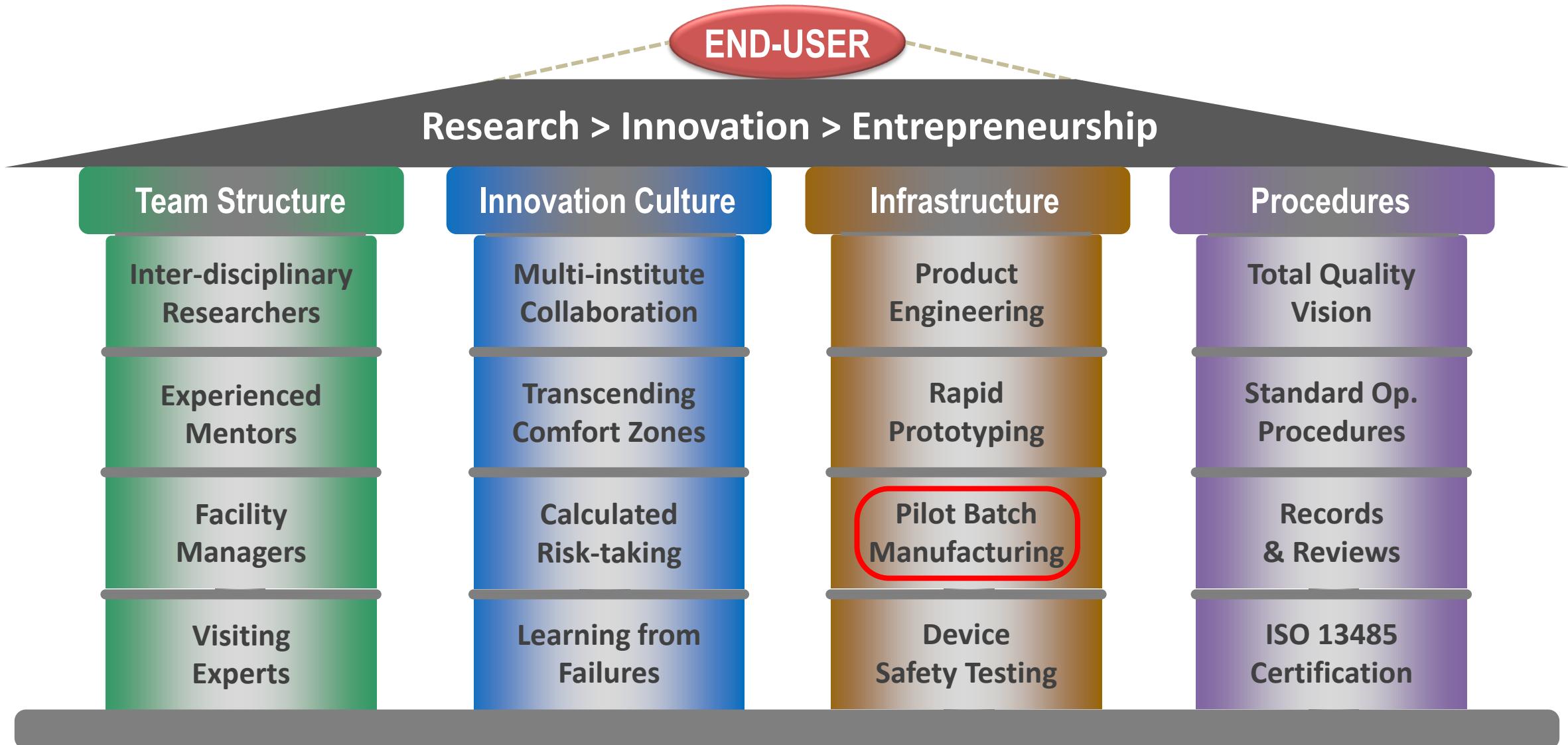
Above-knee prosthesis
(Ratna Nidhi Charitable Trust)



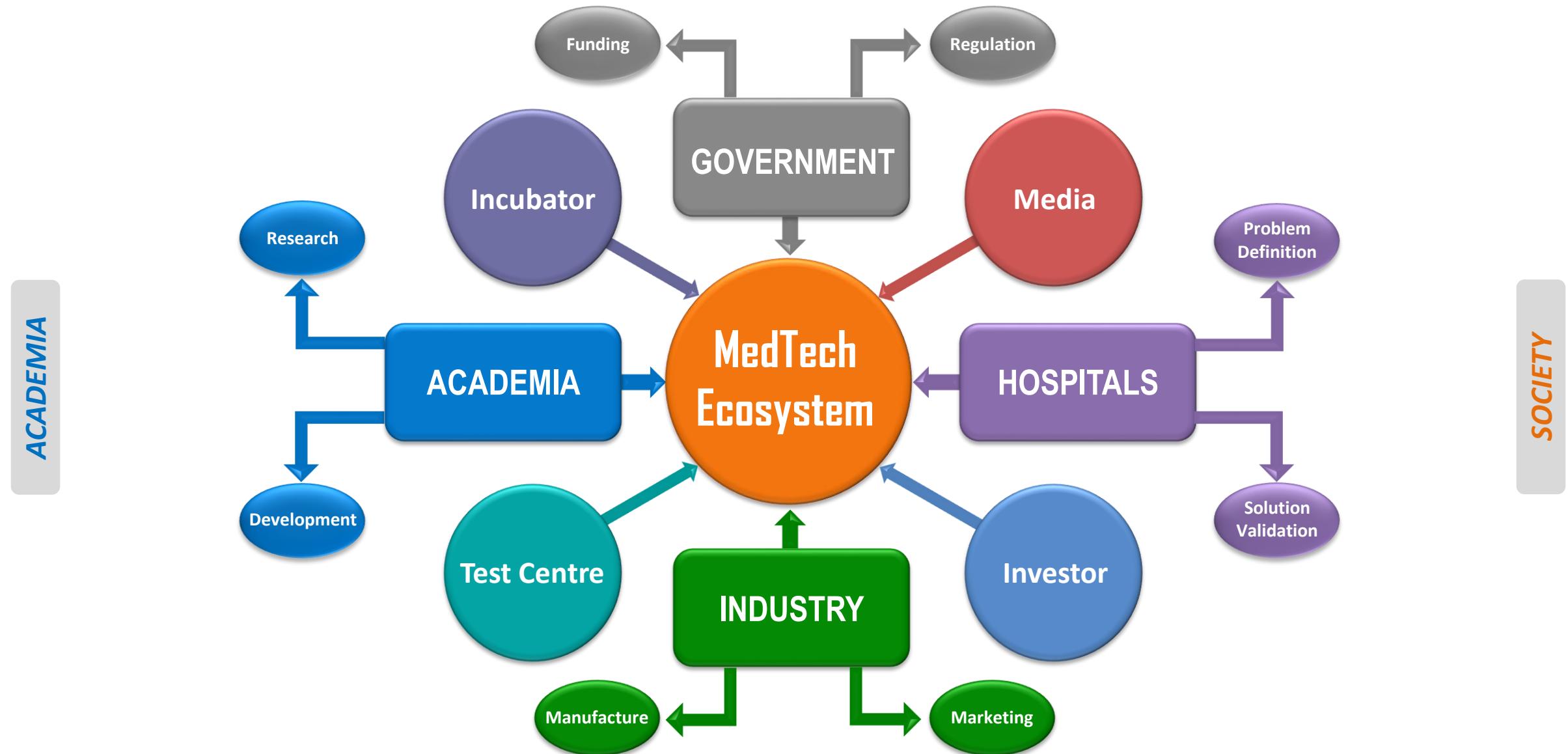
Clubfoot monitor
(Metwiz Materials)



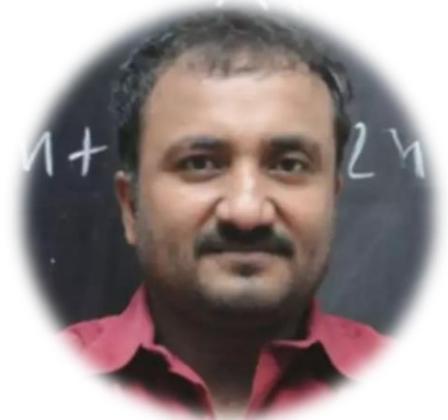
Medical Device Innovation – Ecosystem



Medical Device Innovation – Stakeholders



Medical Device Innovation – Champions



Conclusion – R.E.INV.ENT!



**THE ESSENCE OF
Medical Device
Innovation**

B Ravi

Research-Education-Innovation-Entrepreneurship

BETIC.Org

Running Partner for Medical Device Innovation

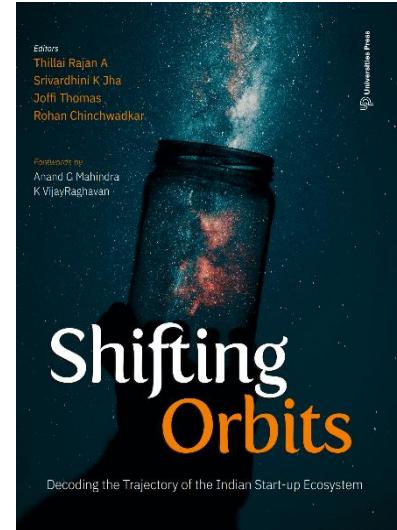
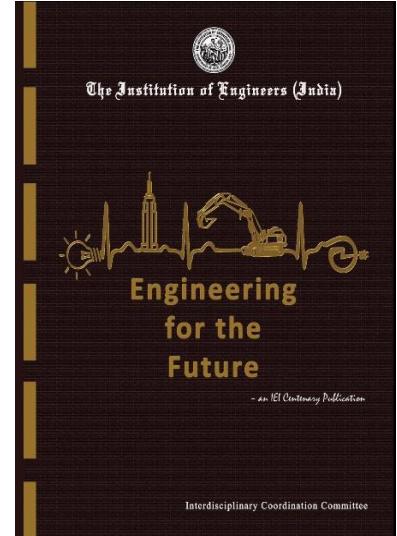
About Partners Services Impact Events new

Purpose Journey Team Resources

About BETIC

Medical devices are critical for healthcare. Indigenous development of novel, suitable, reliable and affordable devices leads to social impact as well as high-value jobs. Since its inception in 2014 at IIT Bombay, Biomedical Engineering and Technology Innovation Centre (BETIC) is building the necessary eco-system by connecting stakeholders – government, academia, medical community, industry, investors and facilitators. The team met several hundred doctors, identified 400 unmet needs, created 200 novel concepts, and filed 50 patents. Further, they developed 20 devices, incubated 15 startups, licensed 5 products to industry, and launched a few in the market.

Thank You!





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