CSIR Initiatives – Technology Development and Licensing, and the Evolving Paradigm

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CSIR Contributions Over the Years

…Addressing National Challenges and Carving out Global S&T Niches…

Global Leadership

Changing R&D from Process Development Focus to Product Development Niches

Leadership in New Technology

2010….

Meeting Challenges of Technology Denial Era

2000-2010

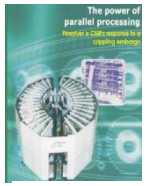
1990-2000

Supporting Self Reliance and Meeting Challenges of Technology Denial Era

1980-90

Saheli

Streptokinase

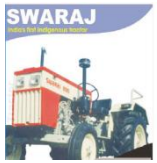


Flosolver - Parallel Processor

Hansa

Supporting Self Reliance

1970-80

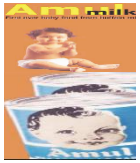


Tractor

Pesticides

Nation Building

1960-70



Baby Food

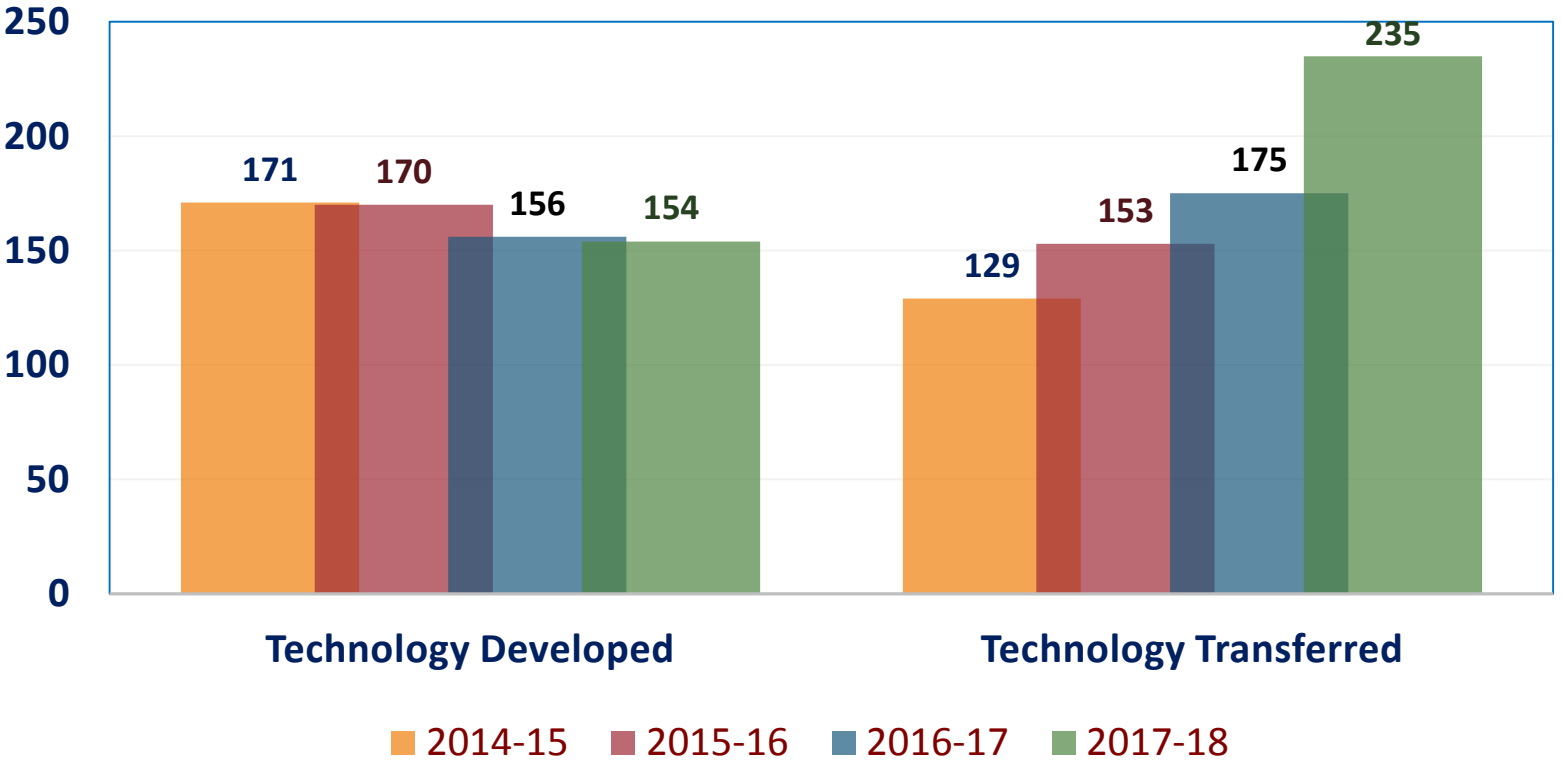
1950-60

Indelible Ink – Mark of democracy!

Recent CSIR Technologies – Global benchmarks

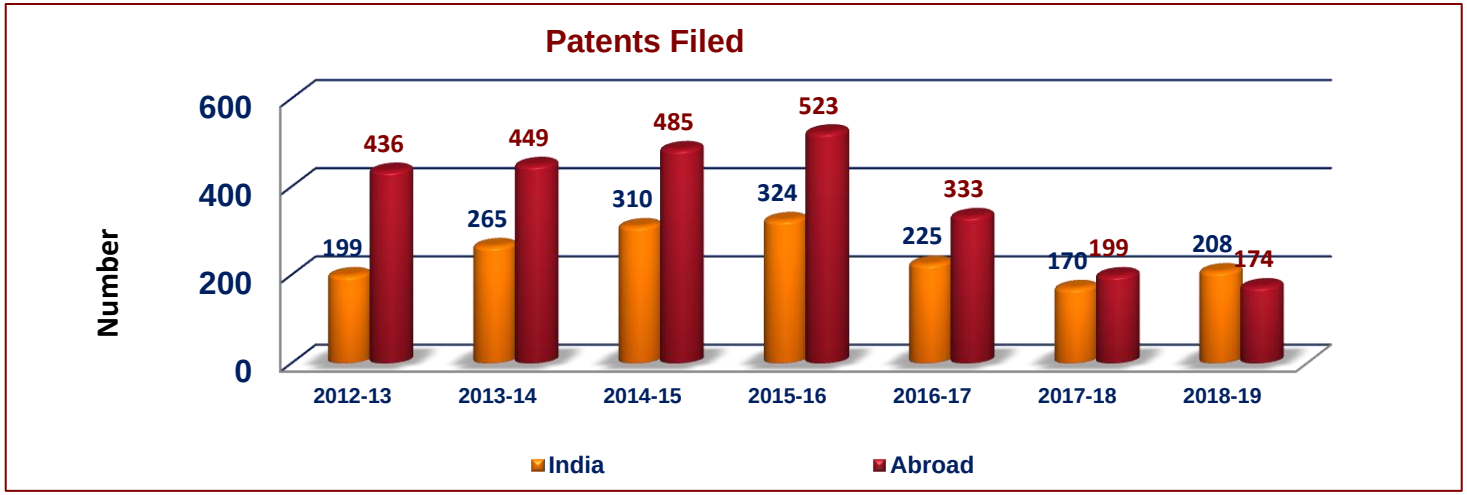
High Purity Gasoline (US Grade Gasoline) & Benzene Plant at Jamnagar	Reliance Industries Ltd. – First grassroots unit with indigenous technology; Investment excluding balancing facilities ~ Rs 312 Cr Estimated incremental export revenue: 40 Million USD/Annum
Wax Plant at Numaligarh	India's 1st and only wax plant Foreign exchange saving of >Rs 500 Crores/annum Refinery profitability increased ~Rs. 77 Cr/year; Export of wax to Kenya, Bangladesh, Nepal and Thailand etc.; Cut down India's paraffin wax import by ~50%
Acrylamido tert-Butylbenzene Sulphonic Acid	World's largest ATBS manufacturer (more than 40% of world capacity) - 25,000 tonnes per annum (tpa) More than 400 local jobs created Revenue accrued to lab (License fees and Royalty) - Rs 330 lakh Market Value - Rs 20 Crore (2014)
Drishti - Transmissometer	Indigenisation at lower costs of a critical technology 47 systems supplied and 32 working in 12 International Airports; 22 systems have been provided to Tata Power SED Order for 200 systems received
Broadband Confocal Microscope with Supercontinuum Light Source	Special Photonic Crystal Fibers to suit the industry's needs Low Cost Indigenous Technology – Paving for "Make in India" - Product priced around at Rs.1.25 crore while similar (different technology) confocal microscopes imported cost about Rs. 4.0 crore
Waterless Chrome Tanning Technology	Unique technology - no water is used for chrome tanning; Eliminates chromium emission and salt usage Commercial scale dissemination carried out in Jalandhar, Kolkata, Ambur, Vaniyambadi and Ranipet clusters; Over 100 tanners have obtained the license of WCTT

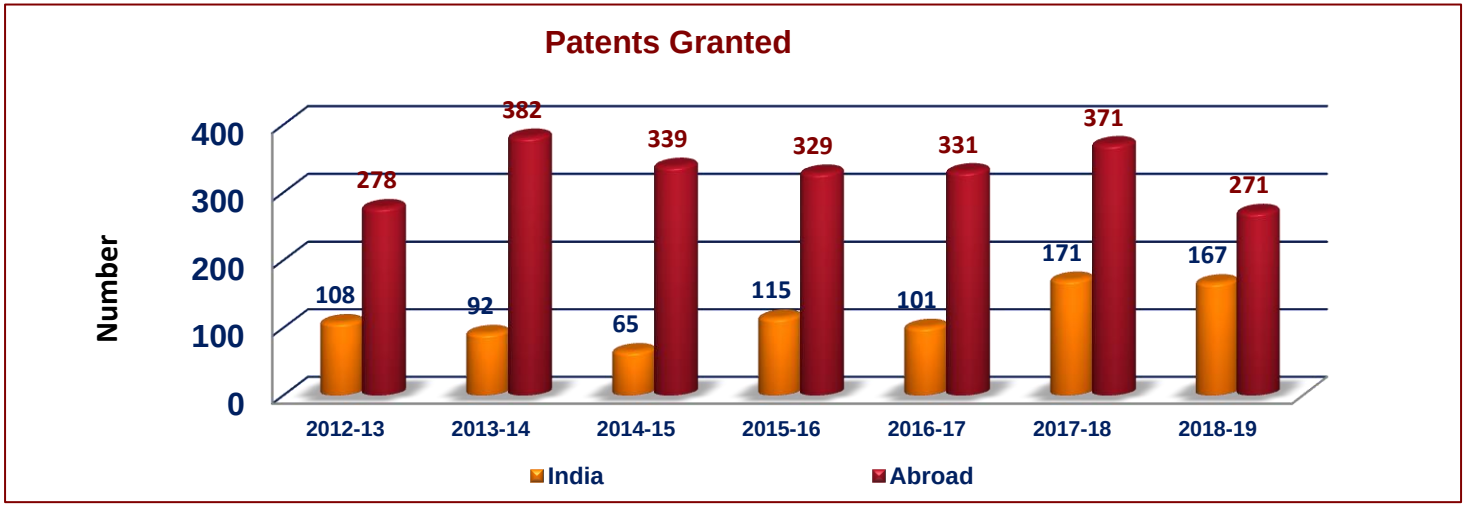
CSIR Technologies – Developed and Transferred



CSIR Licensed over 600 Technologies in last 4 years

CSIR - The Patent Portfolio





CSIR licenses about 7% of its patents

Economic Impact Assessment of Select Technologies

Selected Technologies: Economic Value Creation

Interventions for Industry – Tractors and Streptokinase

Interventions for MSMEs – Soft Coke Oven, Rice Bran Oil, Vitrified Tiles and Terafil Water Filter

Total Direct Value Creation: Rs 32094+ crore[#]

Plan Budget to CSIR : ~Rs. 26000 Crores in last 21 years

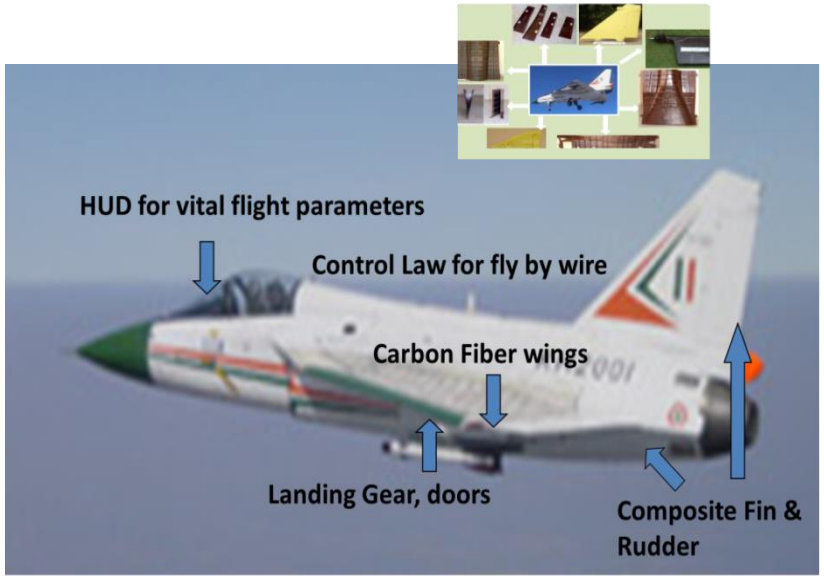
Socio-economic impact assessment is being undertaken for select technologies

#-EIA studies carried by a consultant engaged by CSIR; Value creation numbers are in 2010-11 prices; and Values are calculations/ estimates, based on techno-economic data, company data / balance sheets, and field survey; also includes Notional Public Benefit

CSIR Technologies for India's First Light Combat Aircraft - TEJAS

An Integral Partner with ADA in Design and Development of TEJAS

- Developed and fabricated 165 composite parts
- CSIR-NAL Manufacturing 13 complex composite structural components even today
- Fly-by-Wire (FBW) Control Systems:
  - Flight control laws and air-data algorithms
  - Over 1950 flights on twelve different prototypes, over a continuously expanding flight envelope completed
  - State of art training simulator



Total Economic Value of CSIR's contribution to the LCA Tejas is about Rs 4932 crore

#-EIA studies carried by Project Leaders of Tejas LCA; comprises estimates related to cost of indigenous development vis-à-vis in foreign country, cost of production; cost of imported units, etc.

Success Stories in Licensing – I – CSIR - GE Collaboration

- CSIR-NCL-GE R&D Alliance – originated in 1993
- Alliance operated for over 9 years successfully and emerged as a paradigm in "relationship" management in R&D
- Cash flow to CSIR-NCL from GE of ~USD 8.5 M over the period 1994-2004
- New opportunities with multinational companies - Diffusion of ideas and generic methods developed to Indian industries
- CSIR owns several patents based on generic ideas developed while interacting with GE having relevance to systems other than polycarbonates
- Half a dozen patents assigned to GE
- Led to Setting up of GE's R&D Centre at Bangalore

Success Stories in Licensing – II - Streptokinase

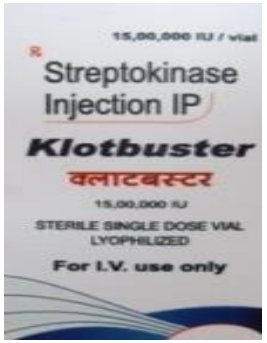
- CSIR-IMTECH's Clot specific Streptokinase Technology Licensed to NOSTRUM Pharmaceuticals Inc., USA in July, 2006
- USD 150 M in Milestone payments + Royalties

Innovation Led, High Science Based Developments

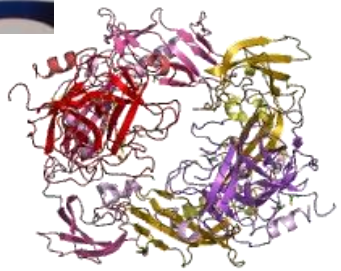
Highest ever licensing deal by CSIR

Clot Specific Streptokinase 2009

Recombinant Streptokinase 2006



Natural Streptokinase 2002



CSIR - Economic Impact Assessment

Streptokinase - Affordable healthcare, Life-saving drug : Economic Value Creation

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Delivering Affordable Healthcare with Clot-buster Drugs

Economic Impact of Technology Interventions--Streptokinase

Manisha G Singh
Nisha Chandran
Zakir Thomas
Dipankar Basu
Samir K Brahmachari

Vol. 51, Issue No. 38, 17 Sep, 2016

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Vol. 51, Issue No. 38, 17 Sep, 2016

Special Articles | *Manisha G Singh, Nisha Chandran, Zakir Thomas, Dipankar Basu, Samir K Brahmachari*

More than 20 lakh patients of ischaemic heart disease-led myocardial infarction can benefit from a life-saving clot-buster drug in India. At the turn of the century, its availability in India was poor and no domestic production existed until the first Council of Scientific and Industrial Research licensee began production in 2001-02. Its price was less than half that of the drug made by a multinational company, the major supplier in the market at that time. Its supply increased to 1,20,000 doses in 2011 after other producers entered the market. Prices dropped by more than 50%. The economic impact of streptokinase technologies, or the value that would be lost if the licensee's streptokinase did not exist, is about `580 crore for the patients.

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Economic&PoliticalWEEKLY

Wasted Efforts

Too Pragmatic

Making Agriculture Attractive

Measure	Streptokinase
Direct Value Creation	1995 - 2011
CSIR Lab : (x) (Rs. in Crore)	1.9
Licensee/s (Cadila, Shasun) (Rs. in Crore)	17
Users (Rs. in Crore)	16000
Total Direct Value Creation (Rs. in Crore)	16018.9
Direct Value Creation multiple	8430x

#-EIA studies carried by a consultant engaged by CSIR; Value creation numbers are in 2010-11 prices; and Values are calculations/ estimates, based on techno-economic data, company data / balance sheets, and field survey; also includes Notional Public Benefit

Success Story in Licensing - III
- Avionics Head-up Display Test Rig

- Comprehensive aviation test platform
- Provides visual inspection, system health monitoring through communication, automated testing, fault debugging, repair and maintenance at system level, semiautomated evaluation of optical parameters
- Modular configuration provides an option to customize the design further for any aircraft platform
- Customer base: Air Force and aviation wings of Navy and Army
- Licensed to Bharat Electronics Limited (BEL), Panchkula in 2017

Estimated Forex saving of ~Rs 50 Crores per aircraft type

In line with the 'Make in India' and 'Innovate in India' initiatives

Recent Success Story in Licensing - IV - DHVANI and ABHIAS

'DHVANI'–"Detection and Hit Visualization using Acoustic 'N'-wave Identification"

- Automated system to detect bullet using supersonic acoustic detection and localization of hits on target by acoustic time delay estimation methods
- Real time and precise system
- Systems for twelve lanes supplied to HQ, SAC, Thiruvanathapuram

'ABHIAS' - Acoustic Based Hit Identification and Analysis System

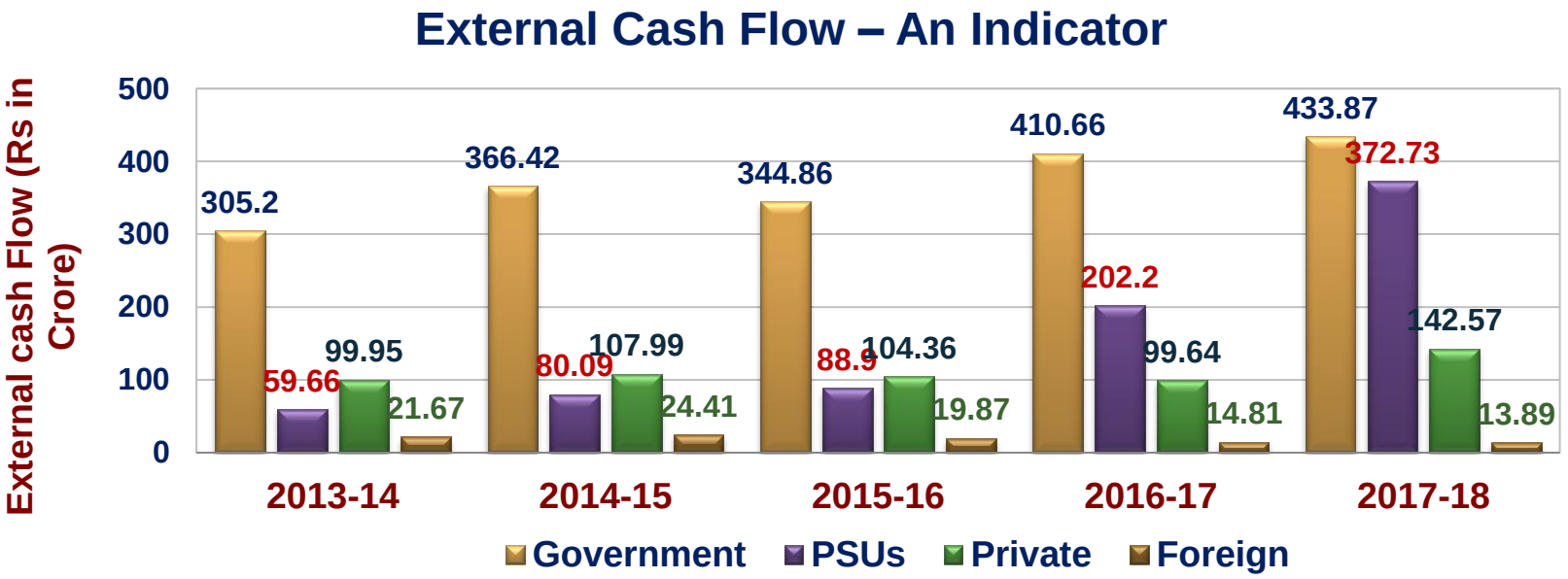
- Acoustic based detection and localization of hits on target by acoustic time delay estimation methods
- Real time and precise system
- Caters to both supersonic and subsonic weaponry
- Variable firing positions without any re-calibration

Cost of the system is ~60% of comparable systems

Exclusive License to Bharat Electronics Ltd (BEL), Bengaluru in Aug 2018

High Value Licensing deal – Rs 4.5 cr premia and 5% royalty

External Cash Flow - Earnings from Government vs. Industry



Govt

Last 5 yrs: Rs 1955.66 Cr
Average: Rs 391.13 Cr

Industry – PSUs/ Private

Last 5 yrs: Rs 1358.09 Cr
Average: Rs 271.62 Cr

Current Statistics

- **Govt:Industry (PSU+Pvt) = 1.4:1**
- **Govt:Private Industry = ~3.4:1**
- **Targeted Govt:Private Industry = ~2:1**

Global Benchmarks

Public Research Organizations, Universities and Federal Laboratories – USA, EU, China and Australia

				
Patent filing from invention disclosures	~50%	~50%	-	~19%$
Patent licensing	~26%	~24%	~6%	~30%
Licensing income (premia + royalties – patents and technologies) (% of research expenditure)	~4-5%	~5-6%	<1%	~1.8%$ ~6.5%$$
Industry Funding (Collaborative/Co-investment/Contract/Sponsored R&D)	6-12%* ~18-21%#	6.5%^ ~32%**	~35%	~17.5%$ ~60%$$
Spin-offs from Inventions/Patents (active)	~7%	~5%	-	~7.5%
Sleeping/Unused patents	~65%	~45%	~17%^^	-

$ NSRC, Aus 2015;$$CSIRO 2017; *DoE 2014 – Revenue from SPP, CRADA and ACTS, NASA 2017 – Revenue from Agreements; #Stanford University, 2017-18; Massachusetts Institute of Technology, Facts 2018 ; ^EU Universities; **Fraunhofer-Gesellschaft, 2016; ^^Includes firms;

CSIR licenses about 7% of its patents

Licensing Income (Pat+Tech): ~0.55% of Government Budgetary Support (GBS)

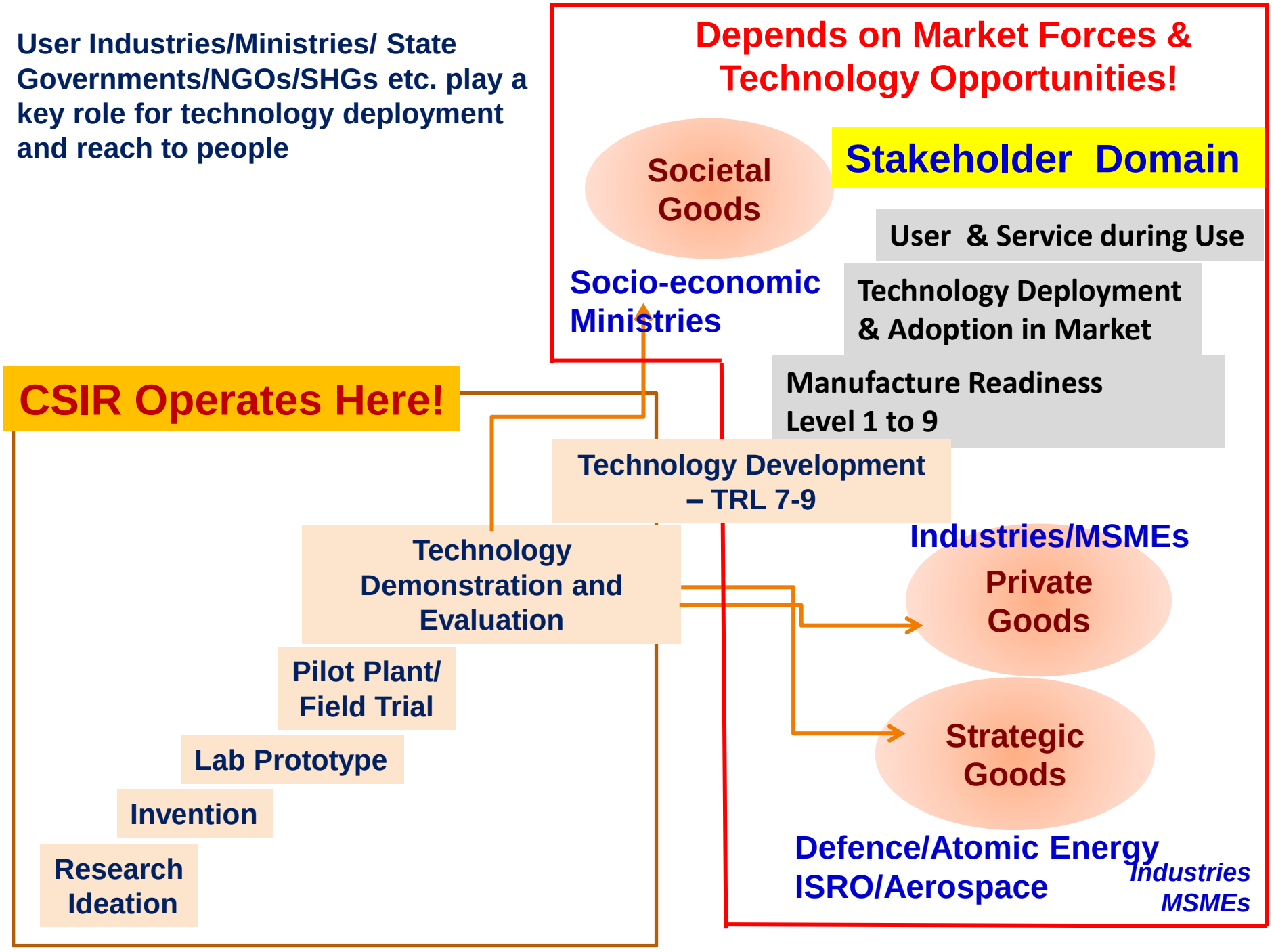
CSIR – GAP, Contract R&D, Consultancy and Technical Services:

External Cash Flow of Rs 960 crore (2017-18); ~54% from industry

Sources: AUTM 2016 Survey Results Highlights; Reports related to EU PatVal-II and PatVal-I results; Scholarly Commons at Hofstra Law, 2017; Federal Laboratory Technology Transfer Fiscal Year 2015 , Dec 2017; CSIRO Australia: https://www.csiro.au/en/Do-business/Technology-licensing/Commercialising-our-work ; University Technology Transfer In China: A Literature Review And Taxonomy; BRIE Working Paper 2016-5; The Challenge of Fundraising in Universities in Europe 2012; Do Companies Benefit from Public Research Organizations? The Impact of the Fraunhofer Society in Germany, 2018; NSRC Website

So, where is the gap?
What are the expectations?

User Industries/Ministries/ State Governments/NGOs/SHGs etc. play a key role for technology deployment and reach to people



Lab to Market: CSIR's Role Limited!

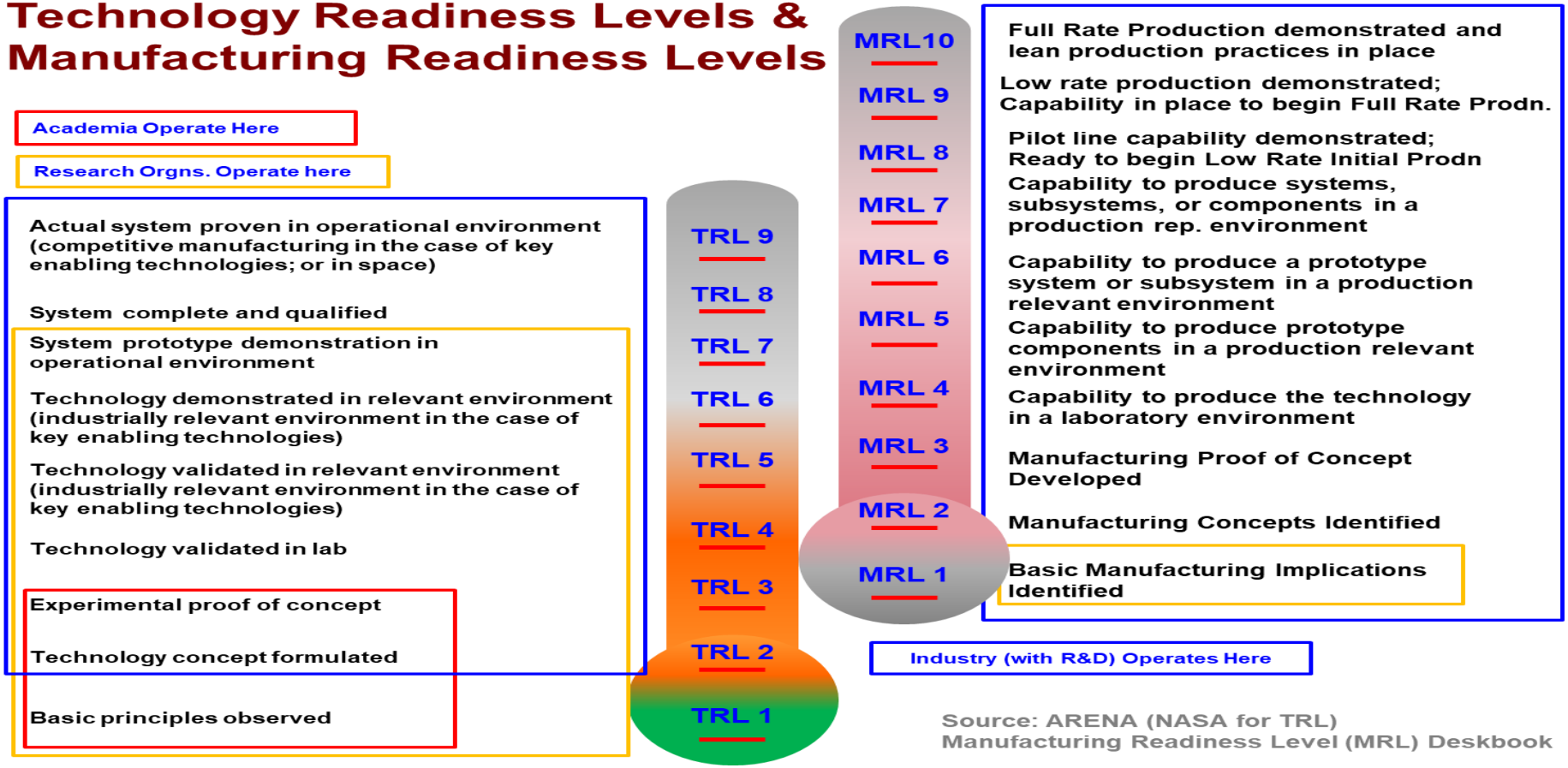
1
Basic technology research: basic principles observed and application formulated (TRL1-2)

2
Feasibility to basic prototype to development and demonstration (TRL3-7)

3
Prototype proven and productizing begun (TRL8-9 and beyond)

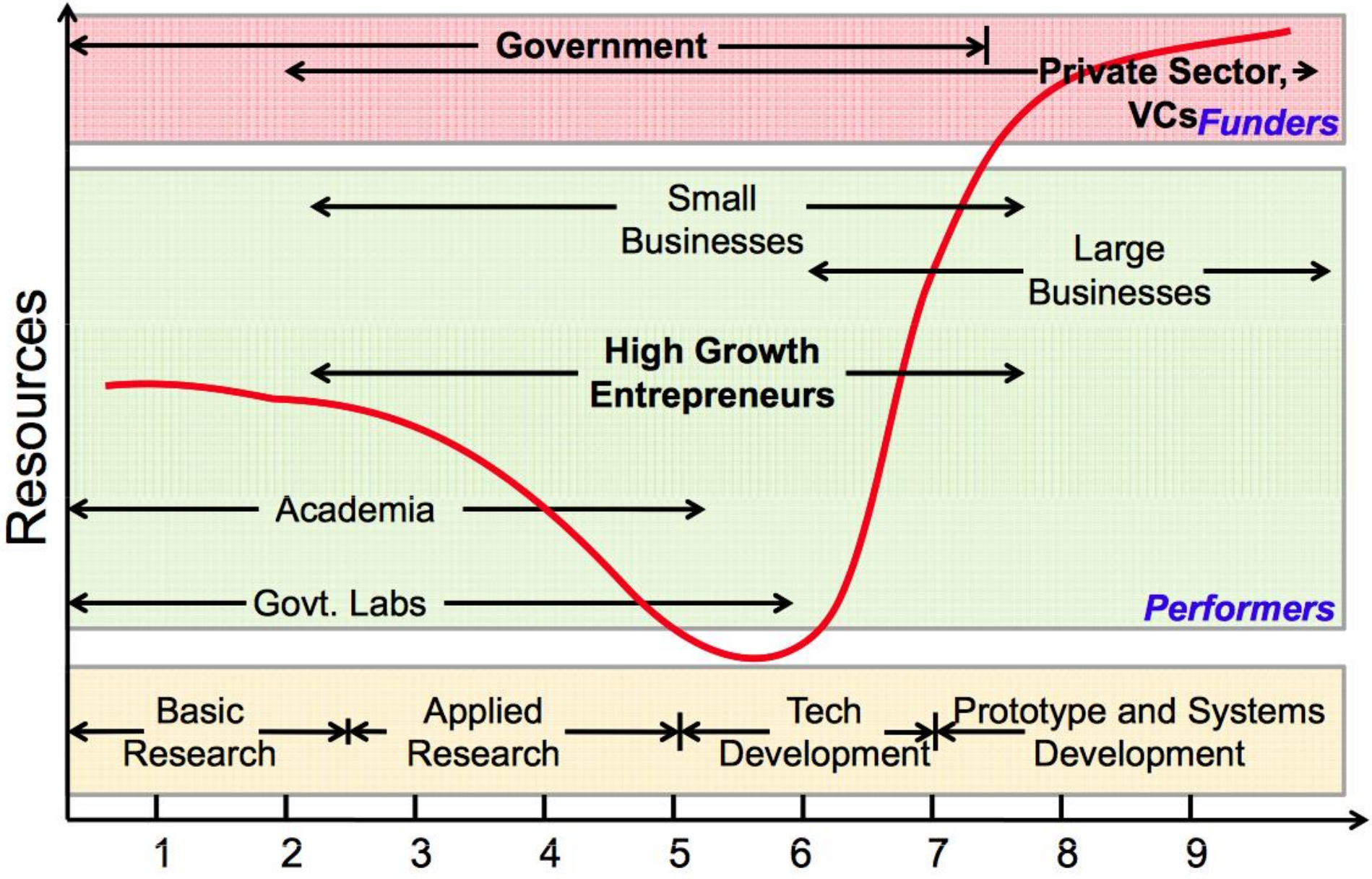
4
Business model fully developed demonstrating investment potential

Technology Readiness Levels & Manufacturing Readiness Levels



Source: ARENA (NASA for TRL)
Manufacturing Readiness Level (MRL) Deskbook

Space that CSIR operates houses the 'Valley of Death'



CSIR Society Meeting 2016

"I would like to see CSIR oriented towards making the life of the common man better, and providing technological solutions to the problems of the poor and downtrodden sections of society"

Shri Narendra Modi
Hon'ble PM and President, CSIR

- **Laying down parameters to assess the performance of CSIR labs**
- **Mechanism enabling internal competition among various labs**
- **Listing one hundred problems being faced by people in various parts of India, and taking up the challenge of solving them technologically within a specified time period**
- **Key areas suggested: sickle cell anaemia among the tribal people, defence equipment manufacturing, life-saving equipment for the jawans, agriculture sector, Medical device manufacturing, energy, solar energy and waste management**
- **Converting lab research to commercial applications**
- **Start-ups to emerge from the research of CSIR labs**

Innovate for India, Innovate for humanity

My appeal to youngsters is: Innovate in India, innovate for humanity. From mitigating climate change to ensuring better agricultural productivity, from cleaner energy to water conservation, from combating malnutrition to effective waste management, let us affirm that the best ideas will come from Indian laboratories and from Indian students.

PM Modi at 56th Convocation Ceremony of IIT Bombay, 11th August 2018

Industry 4.0 – Global Manufacturing Hub

Work is underway in full earnest to transform India into a Global Manufacturing Hub. Keeping in view Industry 4.0, a New Industrial Policy will be announced shortly. In 'Ease of Doing Business', India has leap-frogged 65 positions during the past 5 years, from a ranking of 142 in 2014 to 77.

President Kovind's address to both the Houses of Parliament, 20 June 2019

112 Aspirational Districts

Comprehensive work is underway for the development of 112 'Aspirational Districts' in the country. 1 lakh 15 thousand most backward villages of the country are in these districts. With the development of education and healthcare facilities and infrastructure in these villages, there will be a positive impact on the lives of crores of poor families.

President Kovind's address to both the Houses of Parliament, 20 June 2019

Incubation Centres & Start-ups

हम सभी को जितना अपनी पुरातन संस्कृतियों, सभ्यता पर गर्व है, उतना ही भविष्य की तकनीक के प्रति हमारा आकर्षण है। 80 करोड़ से अधिक युवाओं की शक्ति से भरा ये देश तेजी से बदलते technological landscape में अपनी छाप छोड़ रहा है। भविष्य की तकनीक के साथ भारत के इसी कदमताल से ताल मिलाते हुए बीएचयू में अटल incubation centre की शुरूआत की गई है। बीएचयू का ये incubation centre आने वाले समय में यहां start-up के लिए नई ऊर्जा देने का काम करेगा।

वाराणसी में विभिन्न परियोजनाओं के उद्घाटन एवं शिलान्यास के अवसर पर प्रधानमंत्री मोदी, 18 सितंबर 2018

Technology led economic growth

Innovations and enterprise are going to be the foundation stone for making India a developed economy. A long term sustainable technology-led economic growth is possible on this foundation.

PM Modi at 56th Convocation Ceremony of IIT Bombay, 11th August 2018

New India to take off…

India needs great road infrastructure – Bharatmala is building thousands of kilometres of roads for it.

India needs port-led development – Sagarmala is helping build infrastructure for it.

India needs to go digital in public service delivery– JAM trinity got us there.

India needs a clean economy – increased digital payments and innovations like BHIM App are taking us there.

India needs a unified and simplified tax structure– GST was for that.

India needs to unlock the power of air travel – UDAN is to get even the poor to fly

India needs more skilled manpower – Skill India is for that.

India needs villages connected with i-ways – we have laid 2.7 lakh km of optical fiber network connecting more than a lakh Gram Panchayats

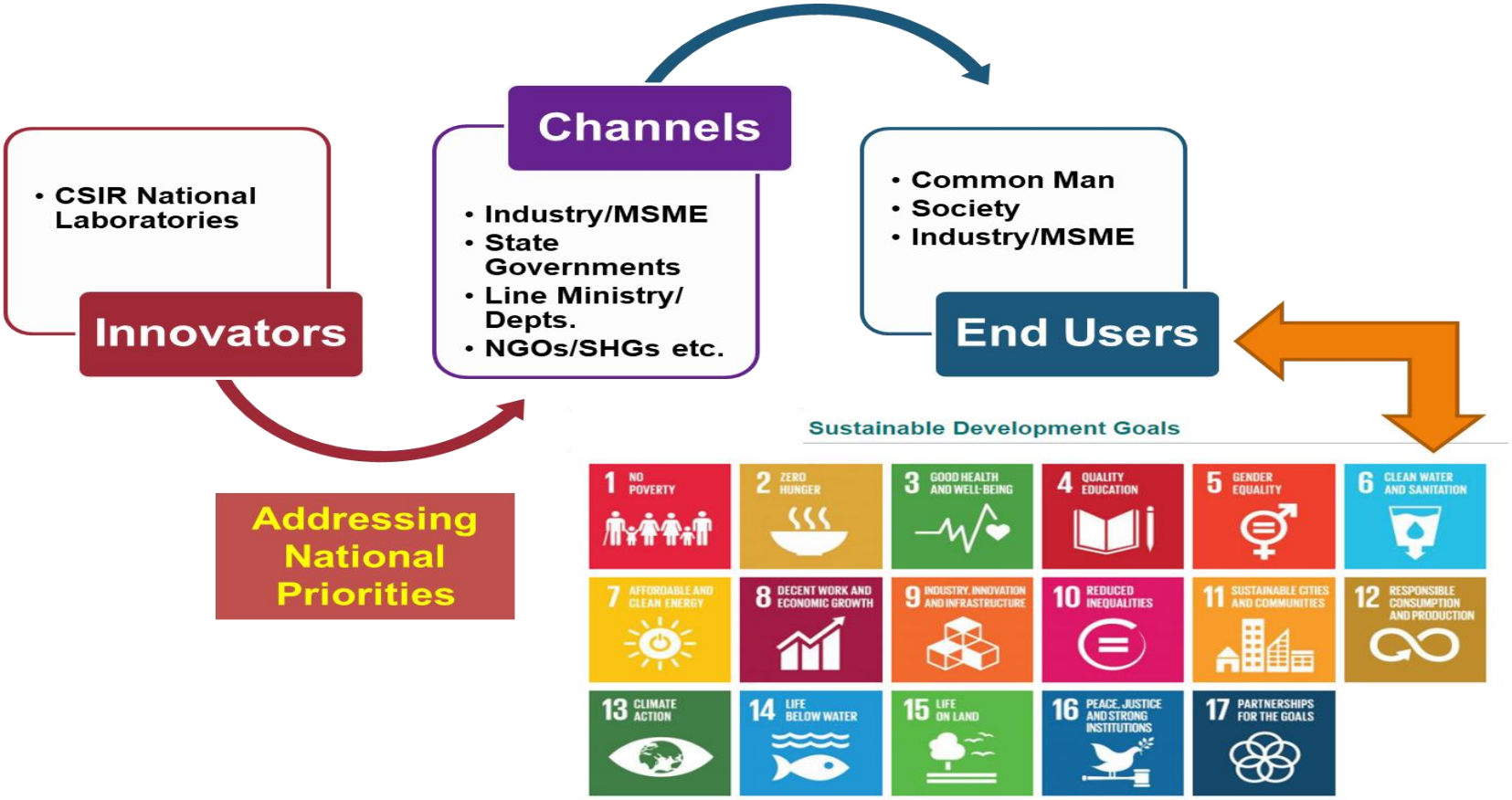
We are future-proofing India in every way, enabling New India to take off

PM Modi at New India Conclave, 16th July 2018

How do we improve the chances?

Reemphasizing the Roles of the Stakeholders

….Bringing in a unified platform for a common goal



Strengthening the Innovation Ecosystem – Enabling Technology Development in the Incubation Phases (TRL 5-7) and Growth Phases (TRL 8-9 and MRL 1-10)

CSIR - New Initiatives for Promoting Technology Generation and Commercialisation

CSIR – Sustaining Excellence

Remaining Relevant to the Stakeholders, and thus to the Nation

← Stakeholders →

- Common Man
- Society

Problem Identification, S&T Interventions, Training, Awareness

- Industry
- MSME
- Entrepreneurs

Gap analysis/Identification of Unmet needs, S&T Interventions, Incubation Facilities, Funds (Loans), Handholding

- Youth
- Children

Fellowships, Skill Development, Promoting Scientific Temper, Mentoring

Reorganizing CSIR Labs - Theme Directorates A New Initiative…

(i) Aerospace, Electronics, and Instrumentation & Strategic Sectors;

(ii) Civil Infrastructure & Engineering;

(iii) Ecology, Environment, Earth & Ocean Sciences and Water;

(iv) Mining, Minerals, Metals and Materials;

(v) Chemicals (including leather) and Petrochemicals;

(vi) Energy (conventional and non-conventional) and Energy devices;

(vii) Agri, Nutrition & Biotech; and

(viii) Healthcare

- Derive synergy from complementary skills and expertise across labs
- Bring in sector-specific industry focus

- Align to Stakeholder needs
- Enhance business focus

New Initiatives for Promoting Technology Generation and Commercialisation

- **Alliance with Ministries & Strategic Sector to create develop and deploy relevant S&T interventions**
- **Linkages with Technology Transfer Organizations and Industry Associations**
- **Revision of CSIR Guidelines for Technology Transfer and Utilization of Knowledgebase - Enhancing Efficiency in Technology Development and Deployment**
- **Create a Separate Corpus for Deploying Nation Relevant Technologies through CSIR Innovation Fund**
- **Evolve Skill Development Programmes as focussed activity and align with national goals and enhance brand image of CSIR**

New Initiatives for Promoting Technology Generation and Commercialisation

- **Mission-mode, Fast track translation, Fast track commercialization, & HARIT projects linked to Common Man, Society, Industry and the Strategic Sector**

- **Set up Technology Incubation Centres across CSIR labs and Technology Innovation Parks where CSIR can play a key role in translating knowledgebase into technologies**

- **Evolve strategic plans for valorisation / monetization of CSIR's Intellectual Property portfolio Invigorating Scientific entrepreneurship**

- **Source funds under 'Corporate Social Responsibility (CSR) Funds' for specific activities**

Revision of CSIR Guidelines for Technology Transfer and Utilization of Knowledgebase

Enhancing Efficiency in Technology Development and Deployment

- **Enabling Scientific Enterprises, Start-ups and Spin off**
  - Move towards equity model in lieu of licensing fee
  - Discounted rates to Start-up/ Spin off for Incubator Space and utilization of facilities
- **Translational Research**
  - 10% of LRF could be utilized by PI for Translational Research & associated academic activities
- **Socially relevant Products/ Processes/ Technologies**
  - Transfer non-exclusive if necessary, free of cost to Micro, Small and Cottage Enterprises
- **Fast Tracking Industrial R&D Projects**
  - Hire specialist manpower/ consultants at 2 times the prescribed CSIR rates for filling the gaps. Permitted enhanced remuneration to Project manpower from Contingency and/ or outsourcing budget
- **Manday Rates**
  - The manday rates be increased to 1.5 times of the existing rates

Boosting Creation of Knowledge Enterprises

- **Scientific Entrepreneurship Scheme:** Researchers permitted to have equity stake in scientific enterprises/ spin offs while in professional employment

- **Knowledge to Equity Scheme:** Scientific Establishments permitted to invest knowledgebase as equity in the enterprises

- **Setting up of Technology Incubation Centres:** Scientific Establishments allowed to set up incubation centres

- **Mobility of Researchers:** Researchers mobility permitted among Industry, Research Institutions, Academic Institutes, Universities and Industries and other Scientific establishments

Scientific Entrepreneurship Scheme – 9 (12) Spinoffs by CSIR Scientists

Guidelines on Conflict of Interest – Scientific Entrepreneurship Scheme

- **Nature/Type of Conflict of Interest covering 15 diverse situations/actions covered**
- **Procedures and guidelines to be followed for managing, resolving & mitigating COI covered:**
  - **Seeking full disclosure of: Shareholders and Shareholding; utilization of resources; projects being pursued; Intellectual Property filed by the Entity; business related matters of the scientific establishment, etc.**
  - **Regulating involvement in laboratory related matters such as projects, purchase, financial and business; scientists' functionary role in business related aspects of Incubation centre, etc.**
  - **Standing Committee at every laboratory**
  - **Disallowing decision-making entities in investing or holding equity**

CSIR for Start Up India and Stand Up India

Technology Incubation and Entrepreneurship Development Centres

Venture Centre at CSIR-NCL Innovation Park, Pune

Supported >180 incubatees till date

- Supported >64 startups as resident incubatees and 20 startups as associate members
- >90 innovators received mentoring and advisory support through pre-incubation programs
- 31% of the startups related to CSIR-NCL through their alumni, scientist or licensed technology
- Supported 8 large/multi-national companies
- >24 companies graduated so far
- 93% of the companies actively pursuing their startup stint; mortality being only 7%

Each CSIR laboratory to set up Incubation Centre

Nutra-Phyto Incubation Centre & Common Instrumentation facility (NPIC-CIF)

A collaborative project between CSIR-CFTRI and Karnataka Biotechnology and Information Technology Services (KBITS), Govt. of Karnataka

CSIR-IICB-Translational Research Unit of Excellence

CSIR-IICB-TRUE @ CSIR-IICB, Kolkata for Biomedical Research

cGMP Pilot Plant for Herbal Preparations

Extraction, Formulation and Packaging of Traditional (ISM) Herbal Medicines

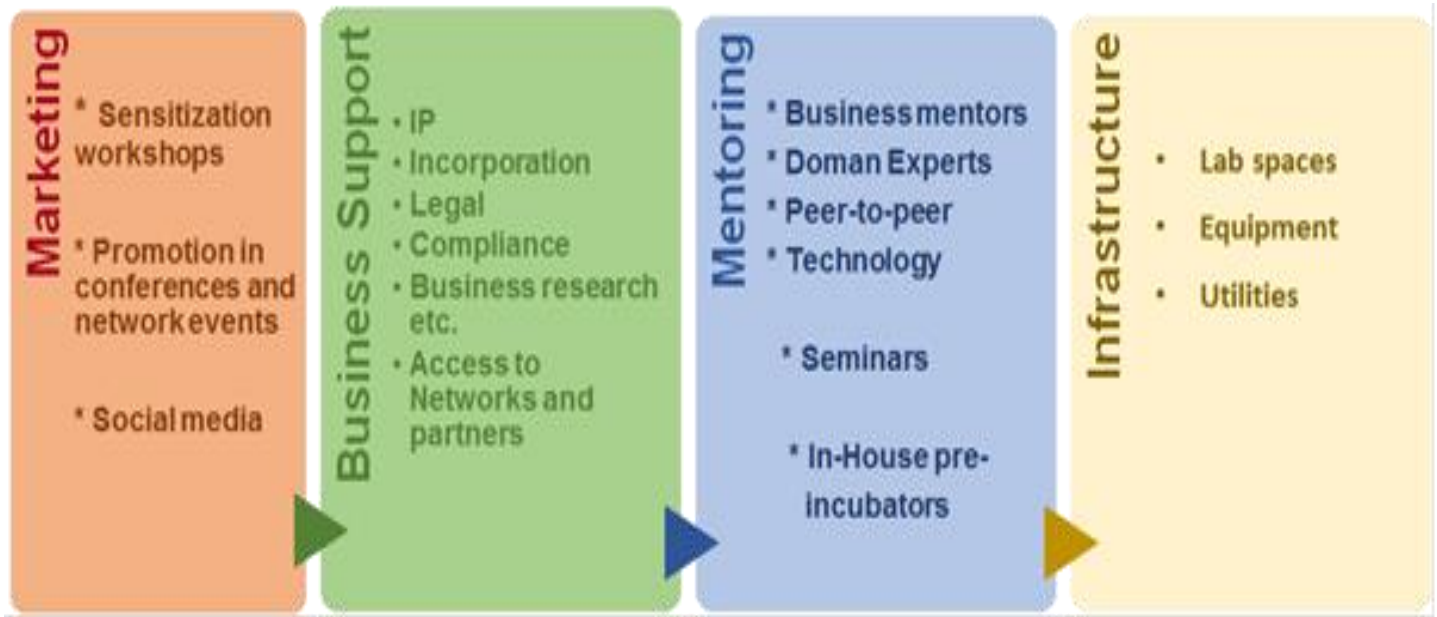
Facility to transform quality herbal drug production in India and its export to US and European markets

Atal Incubation Centre – CSIR-Centre for Cellular and Molecular Biology

A NITI Aayog initiative to promote Start ups

A Section 8 company to promote Startups in Biotechnology/Medical Devices

Strategy to support the Startups



Digital Platform for Showcasing CSIR Technologies and Knowledgebase

http://techindiacsir.anusandhan.net/online/Control.do?_idx

Single Point Window to

CSIR Intellectual Property
CSIR Technology
CSIR Knowledgebase and Services

CSIR Technology Showcase INDIA

...opment,
...g social impact

75 Years of
CSIR Techouching lives

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Socially Relevant S & T Interventions

System for detection of adulteration in milk (KSHEER-SCANEER)

Institute: CSIR-CEERI | Category: Food and Nutrition

The system is capable of detecting adulterants such as urea, salt, detergents, boric acid, caustic soda, Lye (NaOH), soda, hydrogen peroxide and many more unknown adulterates in raw milk. Real-time automated system, Scan raw milk samples at source level i.e. milk collection points in

Swaraj Tractor

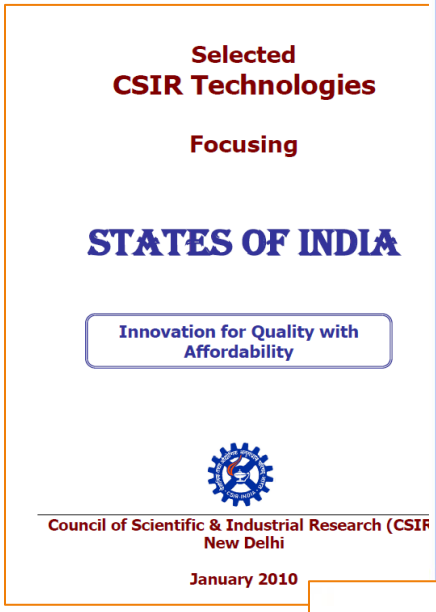
Institute: CSIR-CMERI | Category: Farm Machinery

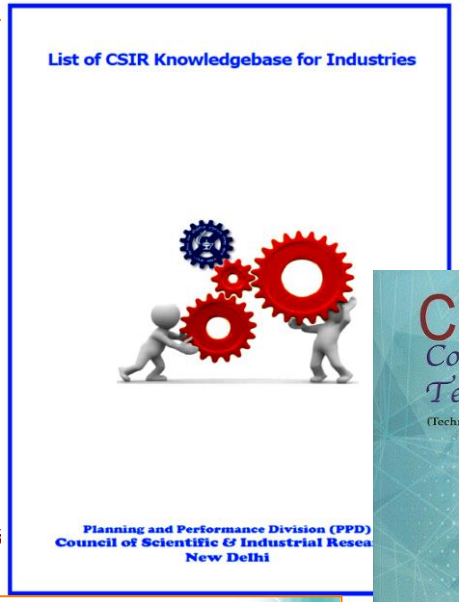
The Swaraj Tractor, developed originally by the CSIR-CMERI and perfected the same to its present level of glory by Punjab Tractors shows the technological strength of CSIR. Swaraj Tractor helped farmers to appropriately mechanize their tilling operations to match with their farm size requirements. When Independent India food security was challenged, CSIR proved

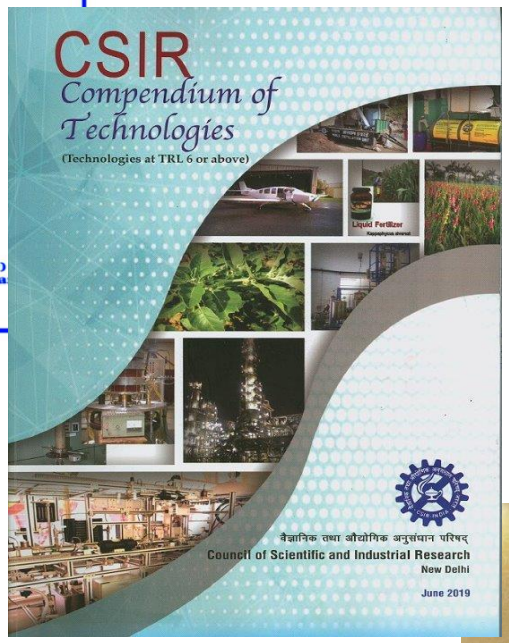
Opportunities@CSIR

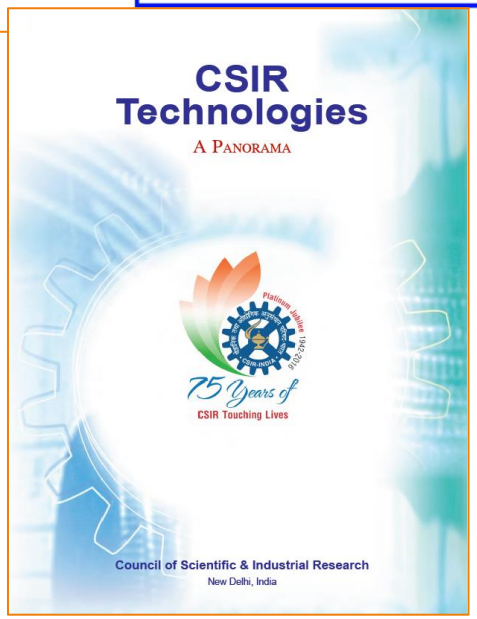
- Collaboration Opportunities
- New Inventions
- Start-up Opportunities
- Funding Opportunities
- Consultancy Services

Technology Compendiums









Linkages with Govt. Bodies - Other Ministries/Depts./Organizations

Cooperation with ICAR for increased productivity & sustainability of agriculture

Cooperation with Min. of AYUSH for research and education in traditional as well as integrative medicine

Cooperation with Indian Navy for joint R&D aimed at indigenisation and self-reliance in advanced technologies for the Navy

Linkages with Industry Associations and Technology Transfer Organizations

CSIR - CII Cooperation

Boost to indigenous technology development and deployment, with relevant linkage to Line Ministries/State Governments

Re-invigorating CSIR-NRDC Cooperation

CSIR-NRDC MoA for enhancing commercialization of CSIR Technologies, Products and Know-how

CSIR-Industry (Including MSMEs) Meets

Conducted/Being Conducted by all CSIR Laboratories

Reaching out to International Partners

India Africa Cooperation

Joint TB Research with Janssen (Johnson & Johnson)

MIDI Ethiopia – Implementing Twinning Programme

CSIR Integrated Skill Initiative

2016-17

- Launch Skill Initiative
- Target **6000** trainees
- Align CSIR activities with National Mission

2017-18

- Target **12,000** trainees
- Launch **45** programmes
- Industry Linked program **20-30%**
- International Skilling
- **3%** may be Technoprenuers

2018-19

- Target **18,000** trainees
- Industry Linked program **30-40%**
- International Skilling
- **5%** may be Technoprenuers

2019-20

- Target **22,000** trainees
- Industry linked programmes **40- 50%**
- **7%** may be technoprenuers

- **Leather process Technology**
- **Paints & coatings for corrosion protection**
- **Electroplating & Metal Finishing**
- **Lead Acid Battery maintenance**
- **Glass Beaded Jewellery / Blue Pottery**

- **Scientific Social Responsibility**
- **100,000 Skilling/ training in next 4/5 years**

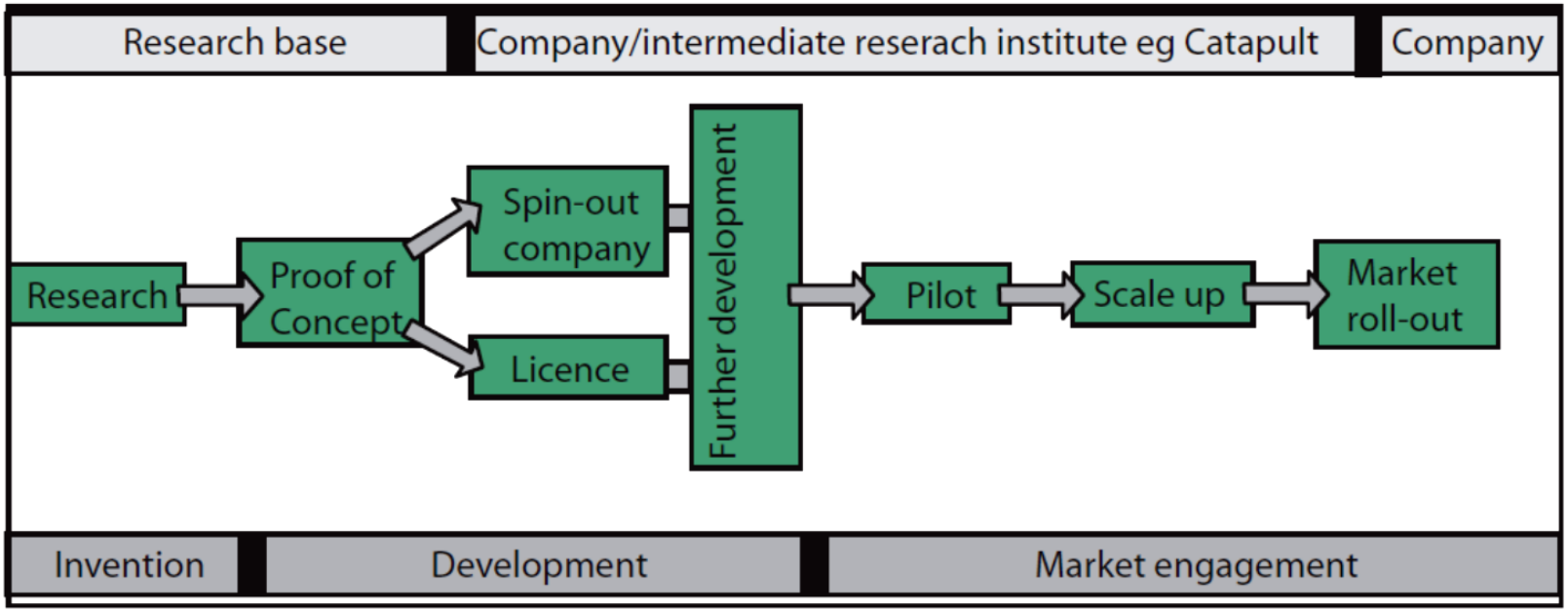
Enhancing Visibility and Awareness – Brand CSIR

CSIR achievements showcased at several major events since CSIR Foundation Day – 26 September 2016

Many more scheduled all across the country, including major cities

Emerging Paradigm

UK: Greater amounts of proof of concept funding and engaging the research base with the innovation agenda



Research base covers people, facilities and intellectual property

"We ask the Government to confirm to us that they will not seek to push the Catapults to generate revenue but instead allow them to grow slowly and organically with a focus on developing the necessary capabilities to support innovation"

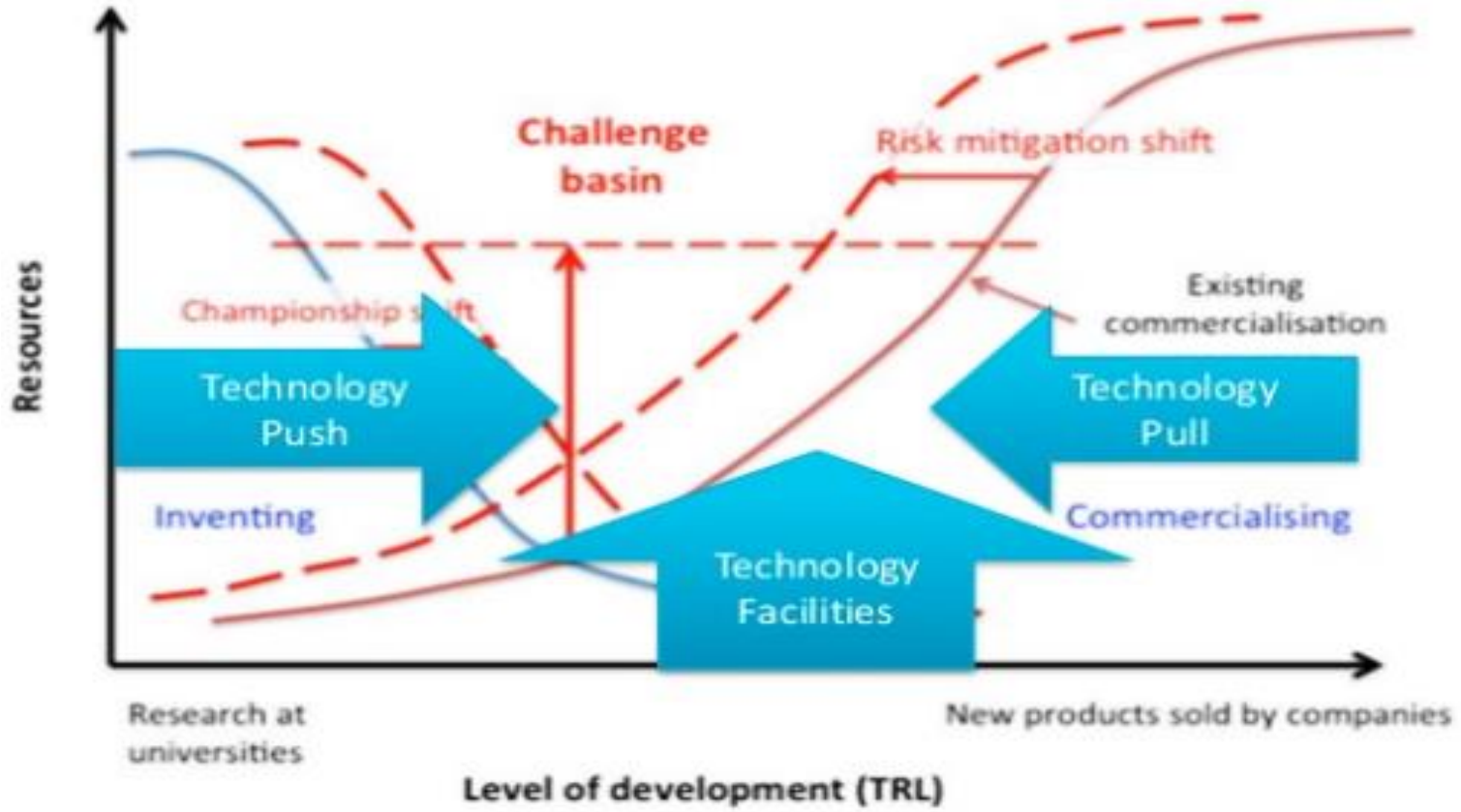
Science and Technology Committee

appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science and associated public bodies

Source: Bridging the valley of death: improving the commercialisation of research, Eighth Report of Session 2012–13, House of Commons, UK

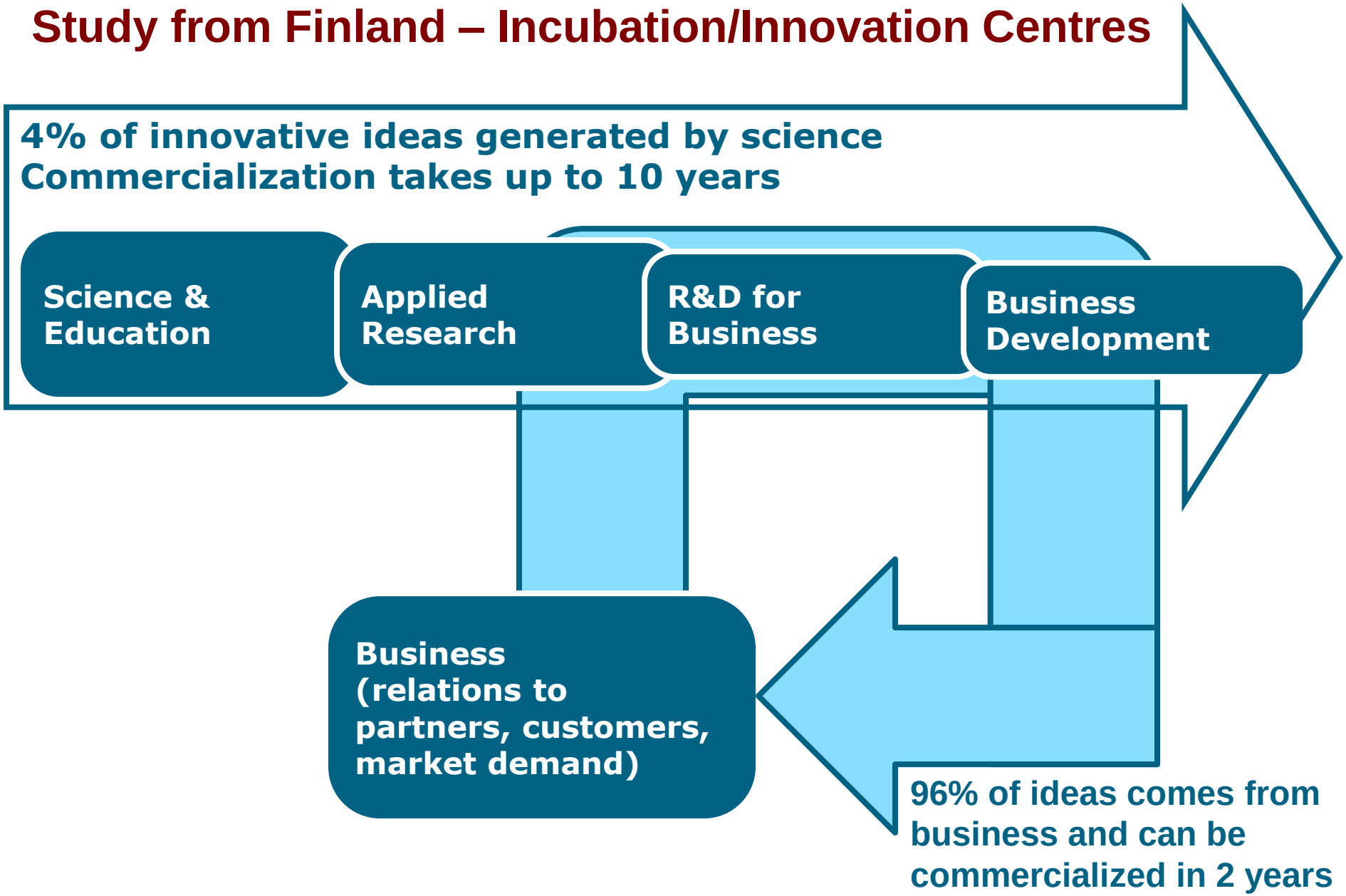
CSIRO: Bridging the 'Valley of Death'

What we do research on → What people are interested in → What makes money



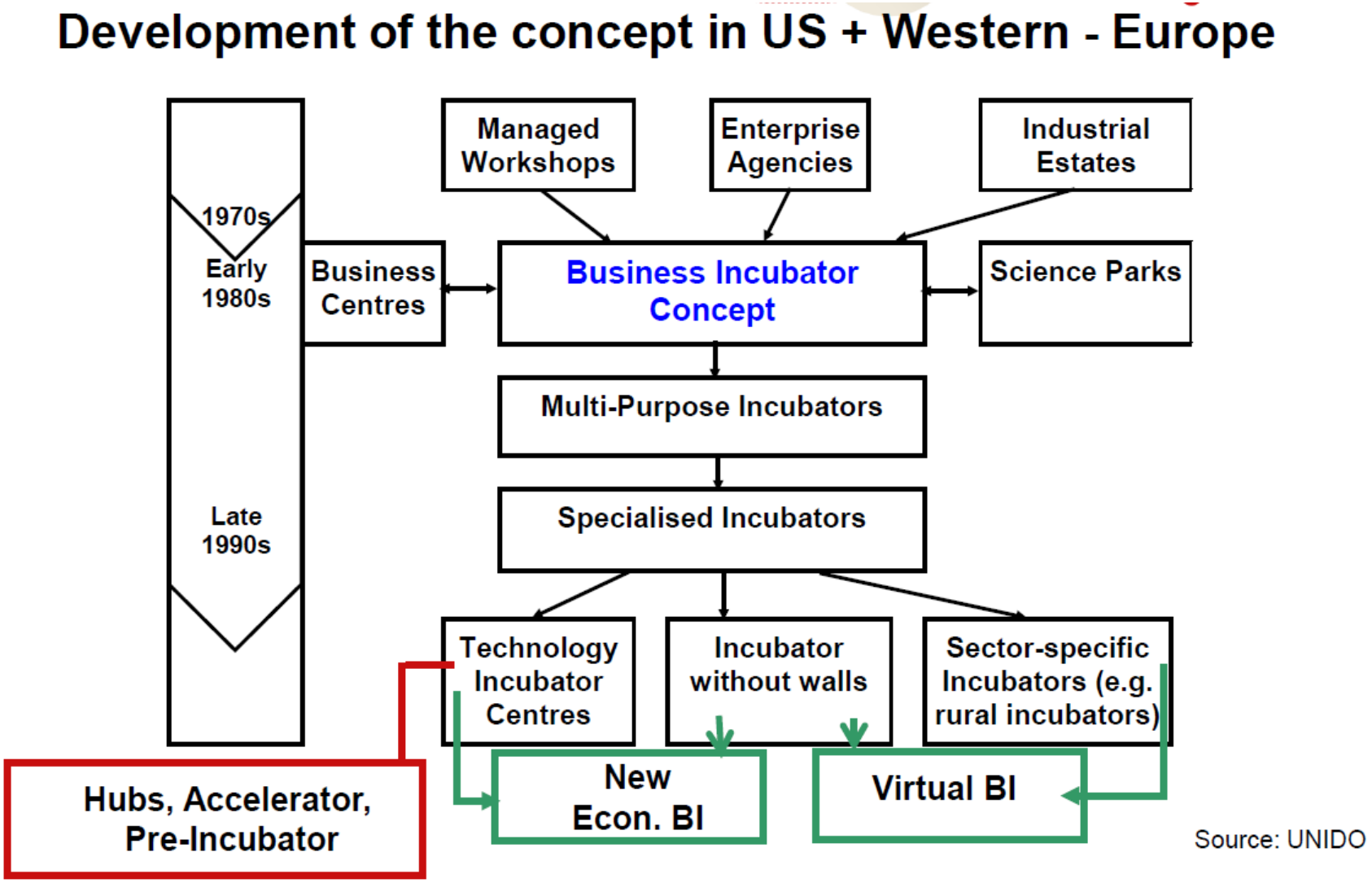
Source: Elliot Duff, 2017 Robotics Roadmap, CSIRO

Study from Finland – Incubation/Innovation Centres



Source: Creating world innovation centres, Skolkovo Summit of Innovation Economy Creators, Mervi Käki, Inno|Praxis International Ltd..

Business Incubators - Structure



Source: Business incubators in the framework of local development, Introduction into the system of Business Incubation, Belgrade 2.4.2015, Expert for GIZ: Franz Dietrich

Technology Transfer With Express Licensing

Federal Laboratory Consortium for Technology Transfer

- Promising technology developed, but not fully exploited and matured for a period of time - potential candidate for express licensing
- Making underused technologies available for benefit of everyone
- Air Force Research Laboratory (AFRL) retains the rights to use the matured technology for the benefit of military applications

- List of existing lab-developed technology
- Pre-negotiated terms and pricing
- Easy application followed by agreement for nonexclusive, partially exclusive, or exclusive rights to the technology

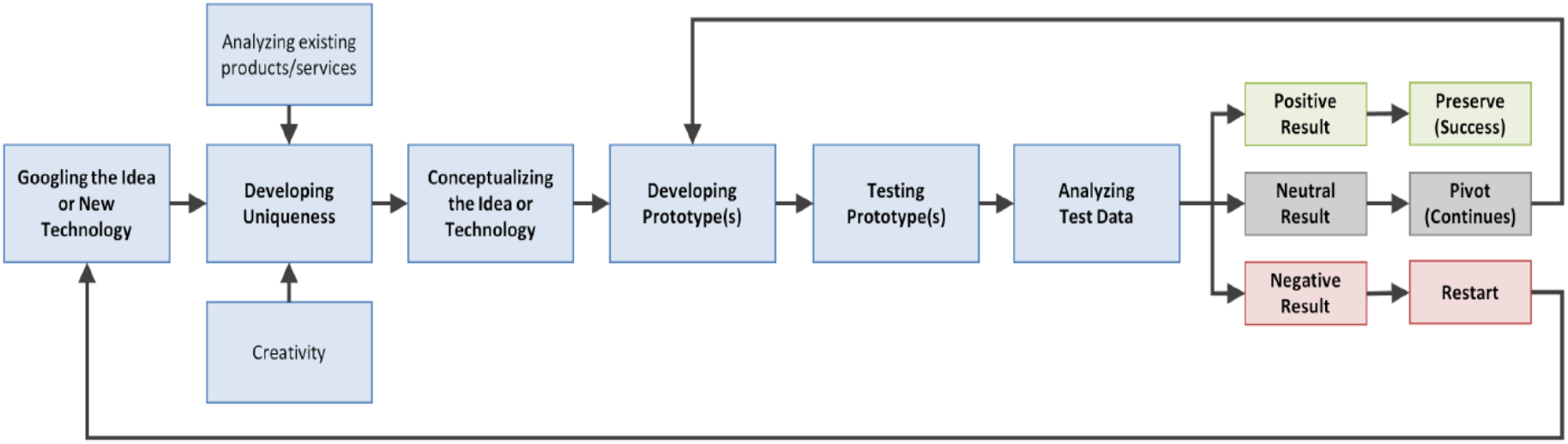
Facilitating Cross-flow of Technology

https://www.federallabs.org/news/air-force-labs-accelerate-technology-transfer-with-express-licensing?utm_campaign=FLC%20Digest&utm_source=hs_email&utm_medium=email&utm_content=63518502&_hsenc=p2ANqtz-9NcCr50sxmYZj8Cprp6l4_l4Bp1s5WJ6Uml8mEBXZCWrPoBAweYdkHDA-kzfpAUGx94uvEeCGXVlP2mw8ttfxf-z4pJAt0C4FusXpih301539vjEM&_hsmi=63518502

Lean Commercialization: A New Framework for Commercializing High Technologies

Application of the lean startup to the commercialization of technologies

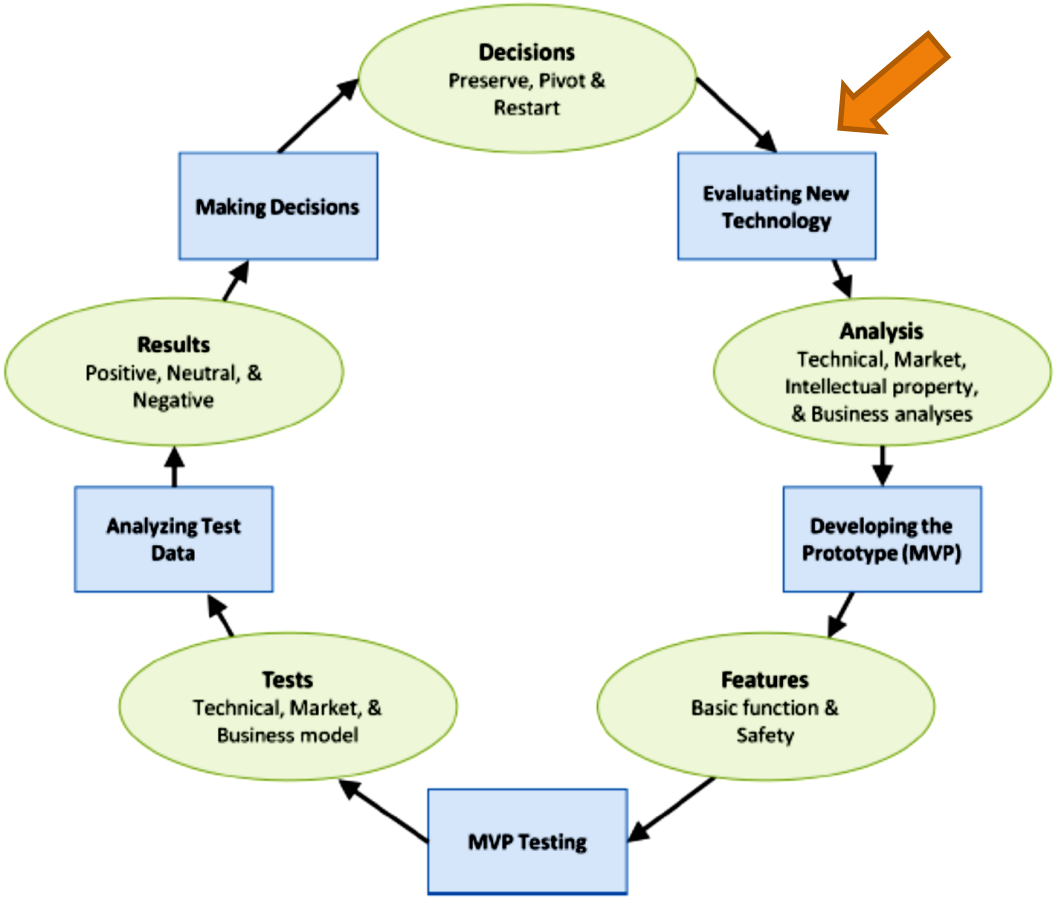
Lean Startup Methodology	Traditional Method
Development of a suitable business model	Execution of a business plan
Development of customers and a market	Concentrates on product development
Organizational structure consists of customer and agile development teams	Not present
Makes use of metrics, accepts failure, and appreciates customer feedback	Features are lacking



Iterative execution of the build–measure–learn loop targeting at testing and validating a 'minimum viable product'

Source: Saheed A. Gbadegeshin, Technology Innovation Management Review September 2018 (Volume 8, Issue 9), 50

Lean Commercialization: A New Framework for Commercializing High Technologies (contd.)



Pre-Commercialization

a. Forming of technology-business team
b. Identification of technology application areas
c. Gathering sufficient market information
d. Having direct contact with end users
e. Attending international business events

Actual Commercialization

a. Having a clear target market
b. Product simplification
c. Subcontracting / outsourcing
d. Testing business models & develop flexible models
e. Getting reference sales
f. Getting feedback from initial buyers

Advocates failing quickly, learning lessons, and thinking about the way forward; Designed to reduce waste, minimize resource use, improve the utilization of a business opportunity, and create a sustainable business or help grow an existing business

Source: Saheed A. Gbadegeshin, Technology Innovation Management Review September 2018 (Volume 8, Issue 9), 50

Nurturing a healthy culture of technology transfer and commercialization at CSIR…

- **Balancing reactive vs. proactive R&D**
  - **Assessing stakeholder needs and markets to identify potential value of lab inventions/ technologies, users and delivery modes**
  - **Stage-gated R&D with SMART Objectives: Specific, Measurable, Achievable, Realistic, Time Bound**
- **Developing lab-specific strategic roadmap that includes its business model**
  - **Flow of funds including ECF; Open or commercial license; sale or assignment; non-exclusive or limited exclusivity or exclusive; premia & royalty terms; etc.**
- **Periodic monitoring and appraisals**
  - **Assessing technologies/inventions to validate claims including TRLs and defining the uniqueness and novelty; GO – NO GO**
- **Selecting an appropriate IP protection strategy, as per needs**
  - **Strategic assessment of IP in force, and plan for portfolio creation (back-up and follow-on)**
- **Establishing responsive business structures and processes**

Thank You