



Asia and Pacific Centre for Transfer of Technology (APCTT)

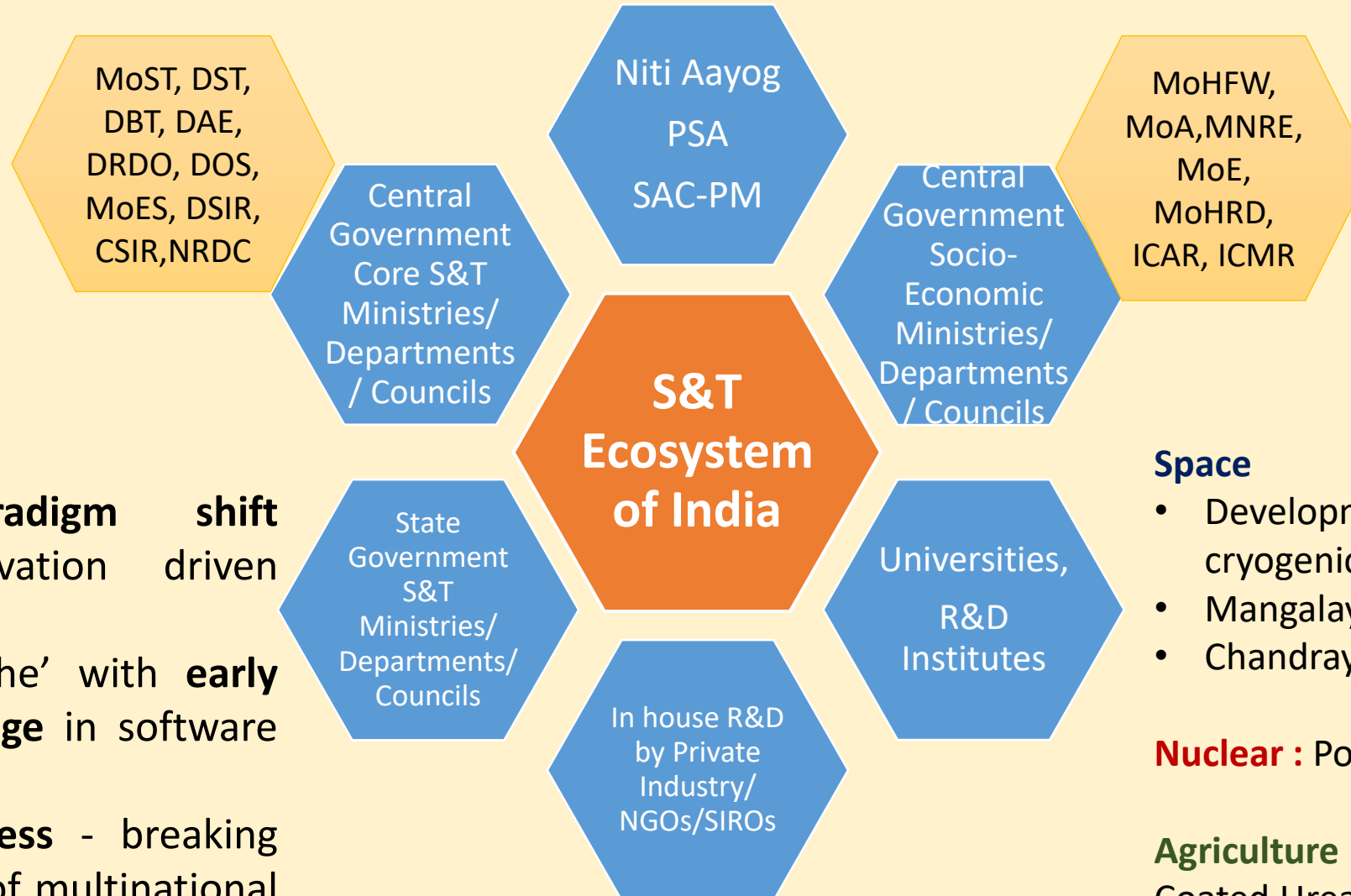
Regional Workshop on Innovative Strategies for Research Commercialization and Technology Transfer
24th Nov, 2021, Tashkent, Uzbekistan

Role of Policy Interventions and Regulatory Frameworks to Accelerate *Innovation, Technology Transfer and Commercialization*

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India @75



Salutary paradigm shift towards innovation driven growth.

Created a 'niche' with **early mover advantage** in software sector.

Industrial success - breaking the monopoly of multinational drug companies with generic drugs

Space

- Development of indigenous cryogenic engine
- Mangalayan Mission
- Chandrayan

Nuclear : Pokharan Nuclear Test

Agriculture : Green revolution, Neem-Coated Urea

Strategic sector: Bhramos, Agni,

Evolution of Science and Technology Policy in India

Policy Framework	Policy Focus
Science Policy Resolution 1958	S&T crucial for nation building and national prosperity, Promote <u>scientific temper</u> .
Technology Policy Statement 1983	<u>Technological Competence</u> and <u>Self Reliance</u> , with focus on indigenous technologies
Science and Technology Policy 2003	Amalgamate Science and Technology with Innovation (STI). Address the socio-economic needs through STI
Science, Technology and Innovation Policy 2013	Linking STI to national development, sustainable and inclusive growth. Vertical integration of all dimensions of STI into the socio-economic processes. Development of innovation ecosystem by promoting partnerships. Strong focus of addressing skill gaps.
Draft Science, Technology and Innovation Policy 2020	To make Indian STI ecosystem globally competitive, STI to address national aspirations such as sustainable development, <i>self-reliant India</i> , entrepreneurship. Build and empower critical infrastructure, Open science framework & inclusiveness, science & gender parity, develop institutional architecture for integrating traditional knowledge systems and grassroots innovation, New mechanisms for financing and Governance of STI, Intensify global linkages

Indian STI Policy Environment

Atal Innovation Mission: With a vision to 'Cultivate one million children in India as Neoteric Innovators', AIM establishing Atal Tinkering Laboratories (ATLs) in schools across India to foster curiosity, creativity and imagination in young minds, and inculcate skills such as design mindset, adaptive learning, etc.

Startup India Action Plan: Aiming to facilitate startups in India, reducing bureaucratic inefficiency/mechanism. States under this program motivated to create and bring their own start-up policies into action to promote the growth of startups in the states

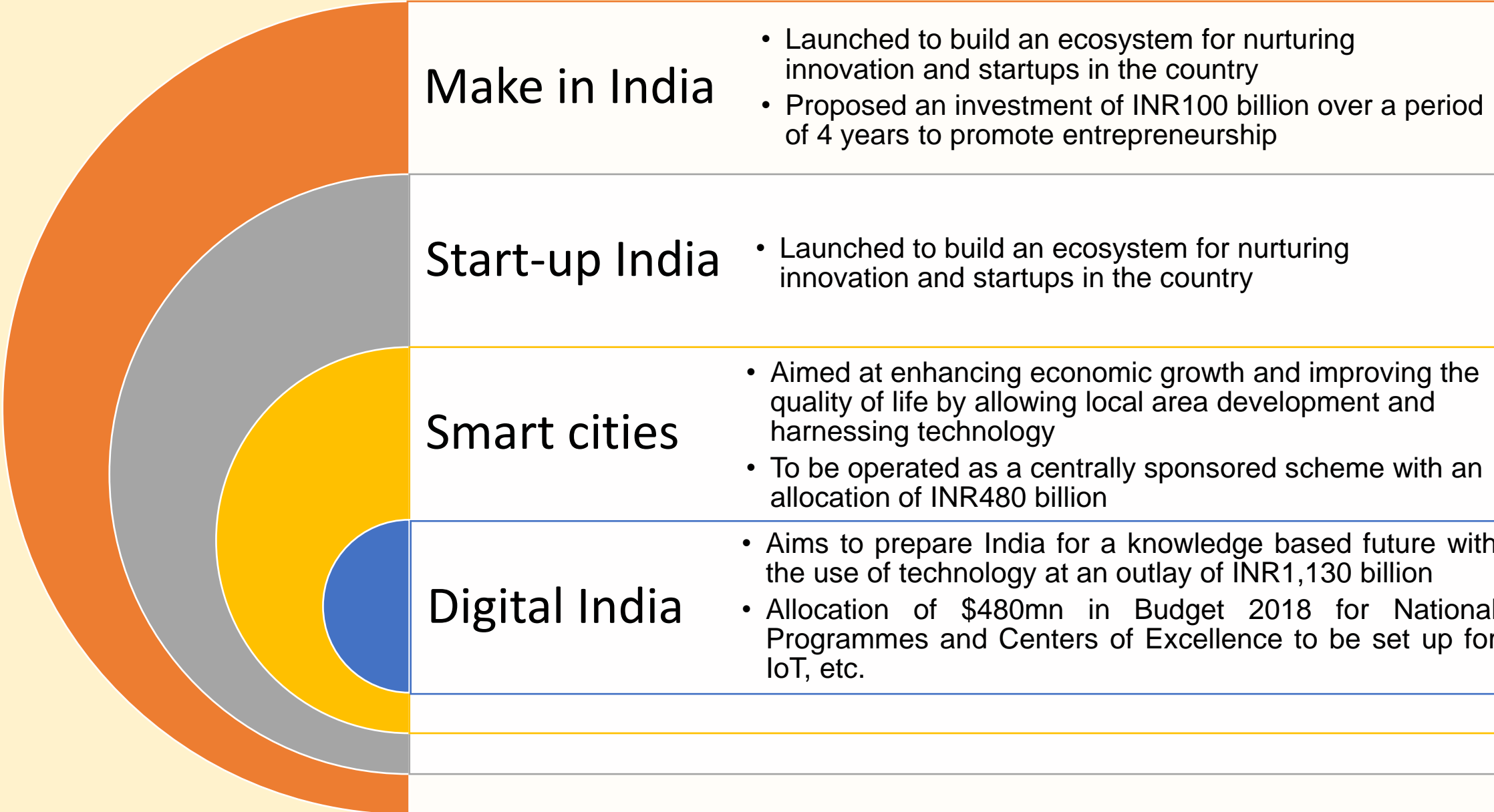
National Innovation and Startup Policy for Students and Faculty 2019: Clear guidelines laid especially for university funded research; mechanism framed for royalty sharing between institutions, faculty and students in cases of IPR generation

R&D Tax Incentives: Tax Allowances (extra amount deducted from gross income), Accelerated Depreciation on R&D Assets, Tax Holiday (exemption from paying corporate tax for certain period), Tax Exemptions (income excluded from tax base)

National IPR Policy 2016: Steps taken for enforcement and adjudication; Institutions like CIPAM, PPH Agreements, Revised IPR Rules, special courts, etc. been created to deliver the mandates

CSR fund for R&D: CSR activities can now contribute towards research across various fields by the companies. CSR funds can also be spent on incubator funded by the center or state or any state-owned companies.

New Initiatives for New India



Creating Enabling Infrastructure

- An initiative to link Jan Dhan accounts, mobile numbers and Aadhaar cards of Indians to plug the leakages of inefficient distribution of subsidies through direct transfer to intended beneficiaries

Jam Trinity



- GST aims to simplify the Indian tax structure by introducing one indirect tax for the entire nation, making India one unified common market
- A 4-tier GST tax structure of 5%, 12%, 18% and 28%, with lower rates for essential items

Goods and Services Tax



- To provide 24x7 power supply across the country by 2019
- Efforts made so far include: reviving coal production, recharging hydroelectric power, restarting gas plants and improving the transmission and distribution of electricity

24x7 – Power for All



- 109.7 million skilled manpower required by 2022
- Pradhan Mantri Kaushal Kendra (PMKK) to be extended to more than 600 districts

Skill India



Indigenous Development of COVAXIN: Integration of Research-Innovation-Commercialization Complete Value Chain

Co-developed by Bharat Biotech with Indian Council of Medical Research-National Institute of Virology

Scaling Up Manufacturing for COVAXIN

Internal Resources

- Acquired Ankleshwar plant from GSK Asia to manufacture COVAXIN®
- Linked agreement with Indian Immunologicals Limited, Hyderabad to manufacture and supply the COVAXIN® drug substance.

Govt Support for Scaling up

- CSIR-Indian Institute of Chemical Technology developed a new process for scaling up the adjuvant production
- Under Mission 'COVID Suraksha' announced US\$ 8.75 M support to repurpose its Bangalore facility
- 3 Public Sector Enterprises, IIL, (US\$ 8.08 M approx.), Haffkine Biopharmaceuticals, (US\$ 8.75 M approx.) and Bharat Immunologicals and Biologicals Corporation Limited-Bulandshahr, (US\$ 4.04 M) received funds to increase vaccine manufacturing capacity

Technology Transfer and Commercialisation

- DBT assisting in technology transfer of COVAXIN® production to 3 institutes namely OmniBRx Biotechnologies Pvt. Ltd., Hester Biosciences, and Gujarat Biotechnology Research Centre,
- Ocugen Inc, US entered into an agreement to co-develop and commercialize the COVAXIN® in US
- Ocugen got exclusive rights for Canada
- Ocugen files for Biologics Licence Application, which is a full approval in US
- Granted Emergency Use Authorization by the WHO testifies to the increasing innovation capabilities of Indian Firms.
- Received the Good Manufacturing Process (GMP) certificate from Hungary for COVAXIN®

Technology Transfer Mechanism in India

Technology transfer primarily takes place from Government research institutions to industry through various modes:

- Directly from the Research Institutes
- Through intermediary organisations whose sole mandate is to aid commercialization of technologies developed at public research institutes or universities.

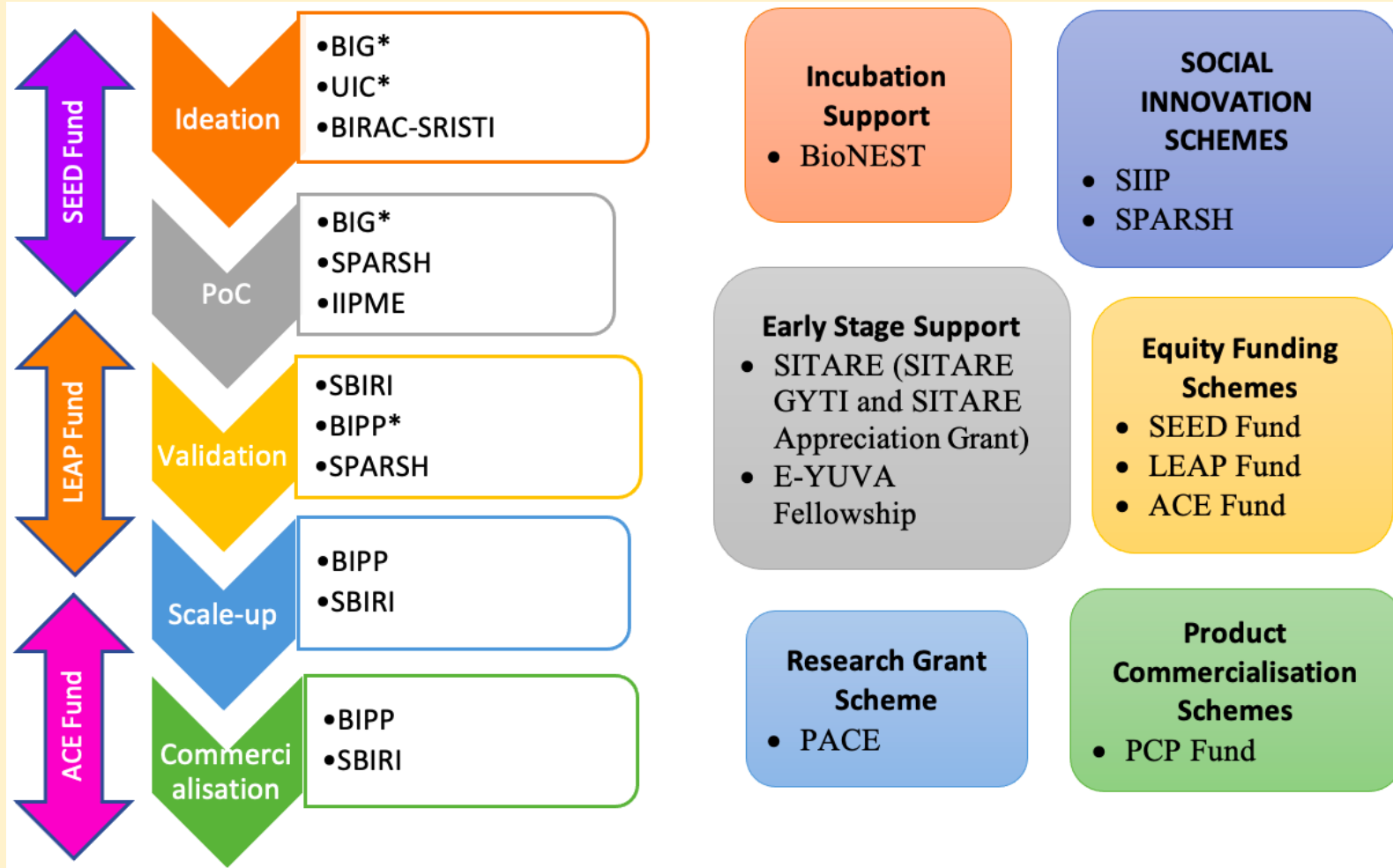
In some organizations special bodies are created to enable transfer of technology. Some examples are

- Antrix of Indian Space Research Organization (ISRO)
- C-Tech of Defence Research and Development Organization (DRDO)
- Centre for Scientific and Industrial Consultancy (CSIC) of Indian Institute of Science, Bengaluru
- Industrial Research & Consultancy Centre (IRCC) of Indian Institute of Technology, Bombay
- Foundation for Innovation and Technology Transfer (FITT) of Indian Institute of Technology, Delhi
- Sponsored Research and Industrial Consultancy (SRIC) of Indian Institute Technology, Kharagpur
- Technology Licensing Cell (TLC) of Research Institutes like TLC of Bhaba Atomic Research Centre, Mumbai

Regulatory framework for Technology transfer in India

- The Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India provides a framework to reduce the processing time for Intellectual Property Rights to encourage innovation and entrepreneurship in the country.
- The organisation, *Accelerating the Growth of New India's Innovations (AGNIi)*, supports ongoing efforts to boost the innovation ecosystem by connecting innovators across industry, individuals and the grassroots to the market and to help commercialise their innovative solutions.
- The Biotechnology Industry Research Assistance Council (BIRAC) supports high-risk, early starters from academia, start-ups, or incubators that have exciting ideas in the nascent or planning stage.
- The government think-tank, NITI Aayog and the Institute of Competitiveness have released the India Innovation Index 2020—it reports that the top three states in innovation environment are Karnataka, Maharashtra and Tamil Nadu.
- MeitY promotes tech entrepreneurship to incubators engaged in supporting ICT start-ups.
- Department of Scientific & Industrial Research (*DSIR*) - Industrial Research & Development Promotion Program (IRDPP) and two Umbrella Schemes on “Industrial Research & Development (IRD)” and “Assistance to PSEs” supporting Industrial R&D

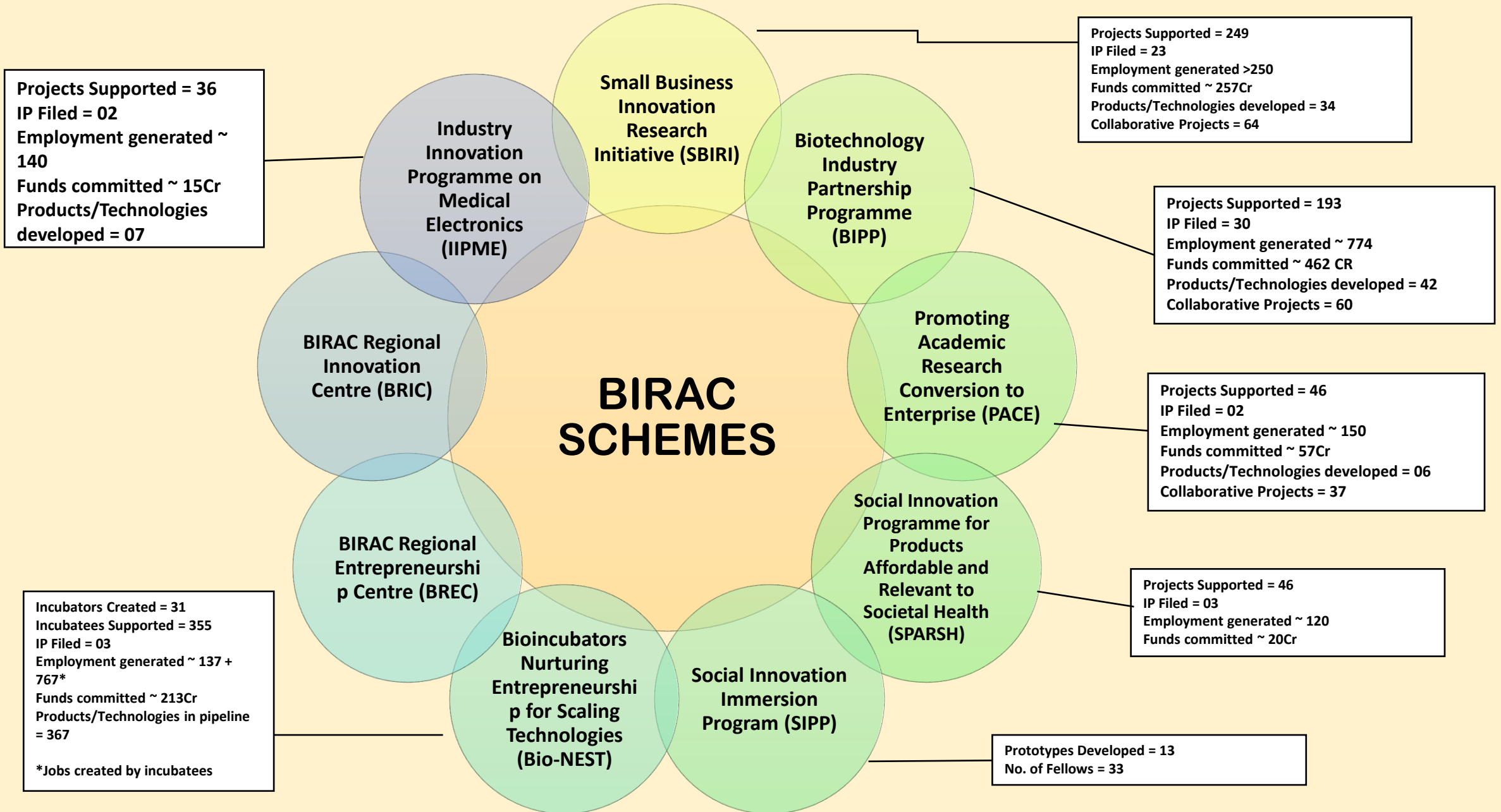
Biotechnology Industry Research Assistance Council (BIRAC)



BIRAC is a not-for-profit Public Sector Enterprise, set up by Department of Biotechnology (DBT), Government of India created to support Biotech enterprises at embryonic stage to undertake strategic research and innovation on nationally important requirements.

Programs ranging from **pre-seed stage** to **maturity** of the firm and commercialisation of technology.

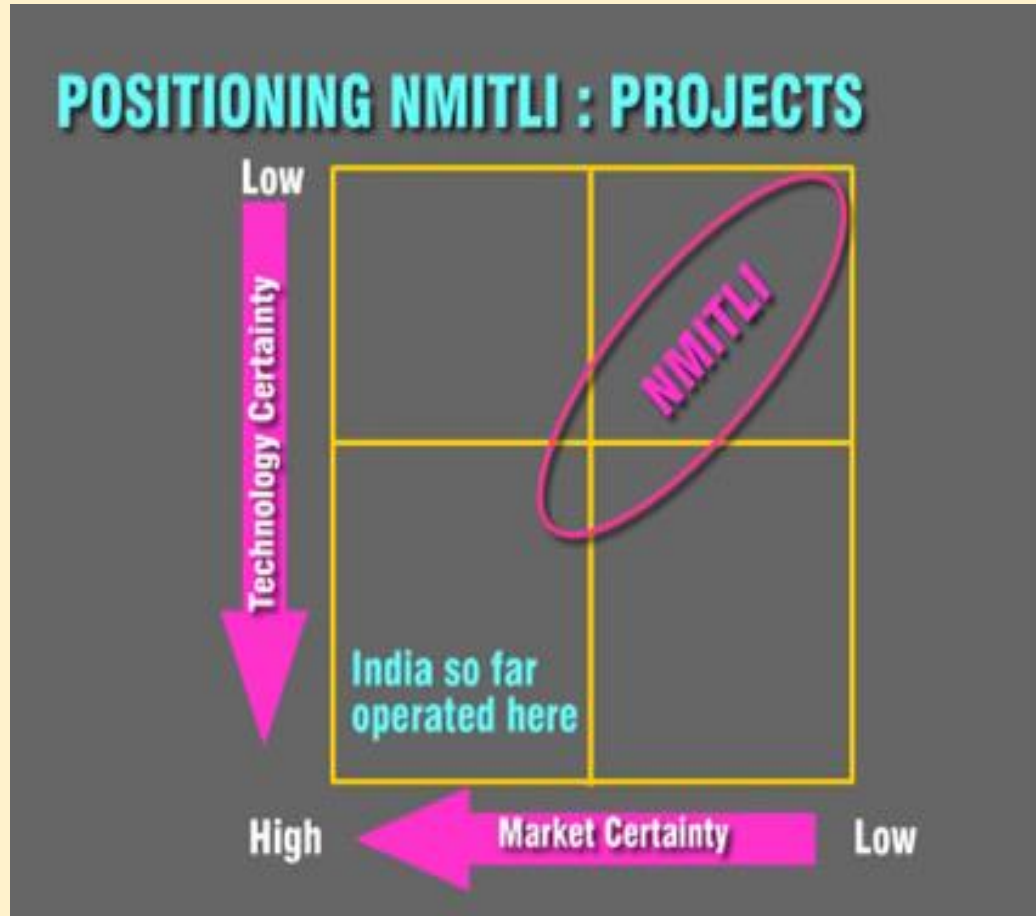
BIRAC Schemes and their Outcomes



National Research Development Corporation (NRDC)

- National Research Development Corporation (NRDC) established in 1953 by the Government of India to promote, develop and commercialise the technologies / know-how / inventions / patents / processes emanating from national R&D institutions / Universities.
- The technology transfer mechanism of NRDC has been shifting with a new thrust to promote start-ups and provide types of support.
- NRDC promotes the innovators in various ways, like awarding meritorious inventions, protection of IP's, evaluation of technologies, knowledge management and providing techno-commercial support to the new innovations/ technologies etc.
- Strengthening regional innovation system model with strong tie-ups with states to create partnerships and jointly develop fiscal and non-fiscal incentives to promote innovation and entrepreneurship.
- Making horizontal linkages with technology parks and clusters.
- Program for Inspiring Inventors and Innovators (PIII) *motivates* the innovators/inventors to develop new innovative technologies and products and utilize technologies for NRDC's business activities.
- As a part of *PIII* NRDC has set up Innovation Facilitation Centers in various Universities, National Institute of Technology (NITs), IITs, Autonomous Institutions and Academic Institutions across the country to encourage innovative talent among the Indian citizens since its inception and nurture innovation related activities.

CSIR-New Millennium Indian Technology Leadership Initiative (NMITLI) Program



- *NMITLI programme mission statement:* To catalyze innovation centered scientific and technological developments as a vehicle to attain for Indian industry a global leadership position, in selected niche areas
- NMITLI distinguished itself from other existing industry-institute partnership technology development program in terms of creating a support system for development of technologies that are 'globally competitive'.
- Positioning the projects where the technology and markets are less known
- Creating novel ways/new initiatives for funding. Strategy of funding: Inverse risk-investment profile, i.e. low investment – high risk technology areas (with global leadership potential)

Success Stories of Technology Transfer through NMITLI

79 largely networked projects

- Agriculture (12), healthcare (25), engineering (11), energy (12), chemicals (9), Information and Communication Technology(10)

Network Partners

- Almost 80 industries
- 270 R&D groups
- Approx 2700 researchers from different institutions

- **Dental implants based on hydroxyapatite and bioglass coating of orthopedic implants developed by IIT-Delhi.**

Clinical research - Maulana Azad Institute of Dental Sciences (MAIDS). Transferred to M/S IHPL; commercialized by KMPL.

Cost-effective implants compare to imported ones; for better design, available in wide range of sizes being widely used in the market.

- **Development of the new Tuberculosis (TB) molecule, SUDOTERB.**

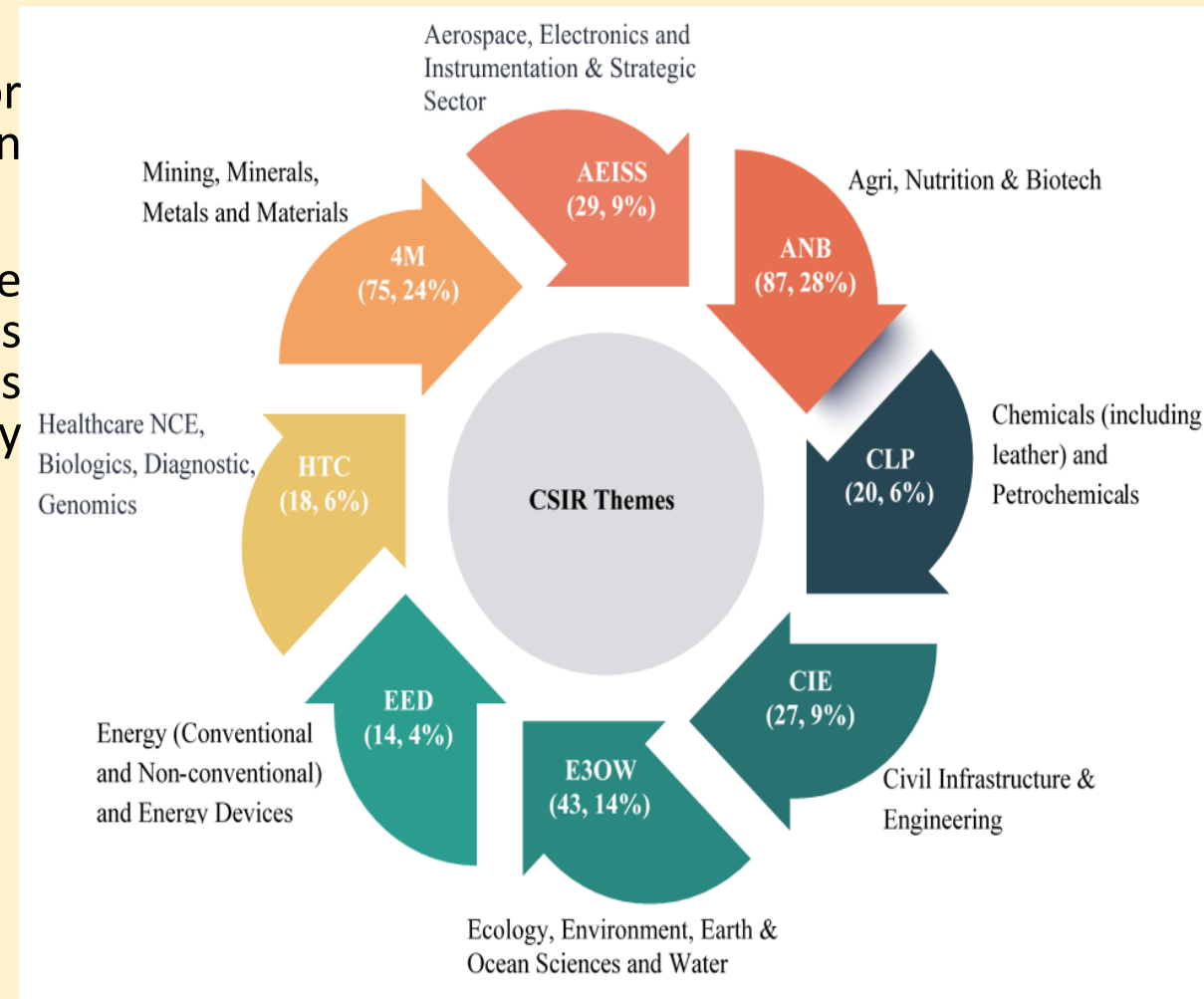
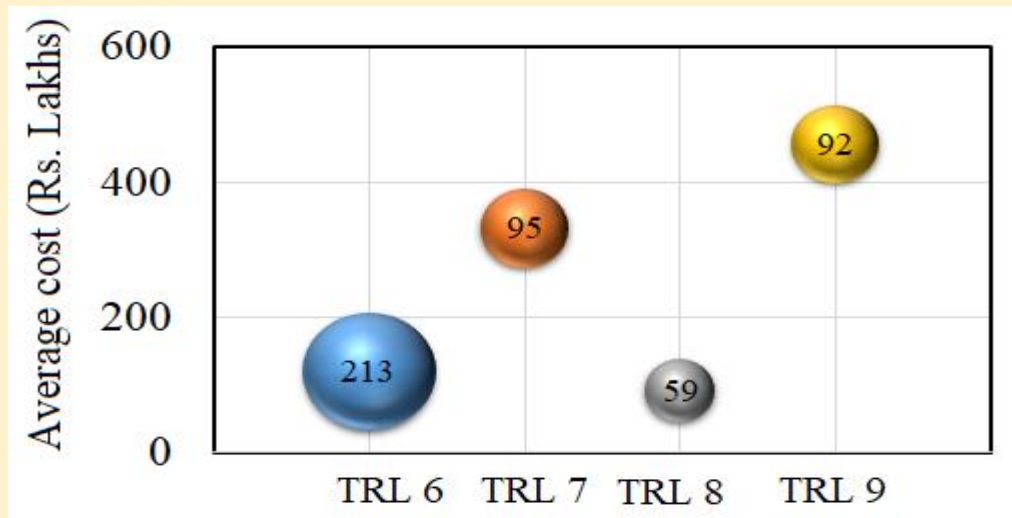
Potential to reduce the treatment time of tuberculosis from 6-8 months to 2-3 months when it is given along with the other drugs.

- **Bio-Suite: A potable software for diverse bio analysis activities.**

Project team of leading research institutions, academia, and industry: TCS, Centre for DNA fingerprinting & Diagnosis, CDRI, IISc, IICB, IIT's (Delhi, Bombay, Kharagpur), University of Madras, ISI, IGIB, IMTECH, NIPER and Saha Institute of Nuclear Physics.

Using Technology Readiness Level Scale for Technology assessment

- TRL scale is emerging as the benchmark standard for evaluating technology development and its readiness in terms of translation/commercialization
- CSIR technologies that emerge from its 37 laboratories are being periodically assessed based on TRL scale. It is thus establishing this assessment scale in India which has become a well established assessment tool in highly technology intensive economies



CSIR Compendium of 313 Technologies. TRL 6 and above

Aroma Mission: A Technology transfer Mechanism of CSIR Initiative for societal transformation

Transformative change in the aroma sector through S&T interventions by introducing high yielding varieties aromatic cash crops, processing and product development

- Released own high yielding new variety of aromatic cash crops including mint, vetiver, lemon grass, palmarosa, ocimum, patchouli, lavender, rosemary, Jammu monarda, etc
- Value-addition to essential oils and aroma ingredients for their integration in global trade
- 5500 ha of additional area under captive cultivation aromatic cash crops particularly targeting rain-fed/degraded land across the country
- Providing technical and infrastructural support for distillation and values-addition
- Conducting training and free dissemination of the sampling material/seed/sucker/planting material
- Enabling effective buy-back mechanisms to assure remunerative prices

Strengthened Livelihood

- Increased the Annual income of the marginal and small farmers from ₹ 50,000/month up to ₹ 2 lakhs/month
- Income generation by Women Self Help Group.
- Various social groups like tribes in backward regions benefitted
- Provided a stable income source to farmers in natural calamity affected zones

Industrial Benefit

- 21-40% of the demand is met by product purchase through Aroma Mission
- Growth rate of fragrance & flavour industry in India is approximately 11%
- India earned near about 55\$ Million in 2018-19
- 75% Entrepreneurs generated through Aroma Mission successful in developing industry

University Driven Entrepreneurship

- Indian universities are increasingly creating ecosystem for innovation and entrepreneurship. Along with reputed institutions: The Indian Institute of Technologies (IITs), Indian Institute of Sciences (IISc), the entrepreneurship culture is getting embedded in over 1000 universities in the country

Some Select highlights

- **IIT Madras Incubation Cell (IITMIC)** at IIT-Madras. Created India's first university-driven Research Park. Incubated startups in deep technologies as well as in rural and social sectors. Incubated more than 200 startups, filed 1300 patents, has created more than 70 R&D partnership across 17 sectors
- **The Society for Innovation and Entrepreneurship (SINE)** at IIT Bombay. It has incubated 32 companies so far. A novel feature is an entrepreneurship cell being run by students.
- **Foundation for Innovation and Technology Transfer (FITT) at IIT Delhi.** Formulated 450 Development Projects, provided, 1900 Industrial Consultancies, Over 100 Technologies transferred to Industries, 100+ Start-ups Incubated. Developed various programs for promoting entrepreneurship such as Faculty Innovation and Research-driven Entrepreneurship (FIRE), Platform for Harnessing Deep Technologies (PHD) Incubator.
- **Society for Innovation & Development (SID)** at IISc. SID have undertaken R&D projects with various big companies including Unilever, Pratt & Whitney, BHEL, GAIL, Hindustan Petroleum, Infosys, Tata, FMC, Microsoft etc. SID has supported about 200 companies & 550 projects till now and have 10 research centers

Way Forward

- Specially developed programs for technology transfer operationalized in public-private partnership mode
- Along with active involvement of private industry in the research and innovation value chain, new types of partnerships like *Triple Helix* (between academia/research organisations, industry and government), Open Innovation (sharing of competencies among stakeholders) are required.
- To move beyond 'Triple Helix' model, towards '*Quadruple Helix*' model of innovation, which is now being incorporated in various OECD countries. It expands the Triple helix model to involve society/public participation in various ways in the innovation process.
- Advisory bodies with participation of private sector and innovation participants should be created for continuously monitoring the problems faced by MSMEs and startups in translation of their knowledge towards getting protection through IPR.
- There is also need for making the application process for patents more user friendly and need for faster decisions on them. Technology Platform at each Institutes website and use of social media to popularize potential technologies should be enhanced. Guidelines for streamlining Intellectual Property (IP) sharing should be made available to all startups.

- The Home Grown Technology along with demonstrating solutions can be affordable to the industry so that it encourages them take it.
- The involvement with the technology developer and the industry should be in the whole value chain from innovation to commercialization.
- Industries can be encouraged to adapt indigenous technologies by giving incentives and awards. To consider giving subsidy to initial adoption by few industries, so, that the risks are taken care.
- Provisions for establishing preferential tax policies for enterprises and investors in the area of technological innovation, encouraging SMEs to develop new technologies and fostering cooperation between SME's, universities and R&D centres should be established.
- Reduce the regulatory costs, which are the main barriers for SME development, measures to reduce administrative charges should be introduced as another way of cutting down costs for SMEs. To reduce financial burden of SMEs, law should be created for favourable tax policies, where reduction or exemption should be applied as corporate income tax or value added tax.