

TOP 100 INDIAN INNOVATIONS (2022)



| INDIAN INNOVATORS ASSOCIATION |





Copyright © Indian Innovators Association 2022
All Rights Reserved.

ISBN 979-8-88849-086-0

This book has been published with all efforts taken to make the material error-free after the consent of the author. However, the author and the publisher do not assume and hereby disclaim any liability to any party for any loss, damage, or disruption caused by errors or omissions, whether such errors or omissions result from negligence, accident, or any other cause.

While every effort has been made to avoid any mistake or omission, this publication is being sold on the condition and understanding that neither the author nor the publishers or printers would be liable in any manner to any person by reason of any mistake or omission in this publication or for any action taken or omitted to be taken or advice rendered or accepted on the basis of this work. For any defect in printing or binding the publishers will be liable only to replace the defective copy by another copy of this work then available.

CONTENTS

<i>Acknowledgement</i>	9
<i>Foreword</i>	11
<i>Preface</i>	13
ECOSYSTEM: PUBLIC-PRIVATE-MEDIA	15
1. Startup India	15
2. Defence Innovation Challenges	17
3. NIDHI-PRAYAS, DST	19
4. Biotechnology Ignition Grant Scheme (BIG), DBT	21
5. MANAGE-CIA	23
6. Technology Incubation and Development of Entrepreneurs (TIDE) 2.0.....	25
7. National Innovation Foundation (NIF)	27
8. MOE's Innovation Cell.....	28
9. NRDC, DSIR.....	30
10. Impact Investing.....	32
11. State Innovation Councils.....	34
12. Incubators/Accelerators.....	36
13. Think-Tanks.....	42
14. Media.....	45
15. Indian Diaspora	47
NOMINATE INNOVATION FOR THE YEAR 2023	53

GROUP A – AGRICULTURE	55
1. Nano Urea – Dr. Ramesh Raliya and IFFCO	56
2. AI-IoT Robotic Aeration Device for Aqua-Ponds-Bariflo Labs.....	58
3. Poultry Litter Raking-Pakshi Mitra Poultry Technologies.....	60
4. Automatic Composting Machine – Agnyas Waste Management Private Limited	62
5. Biofertilisers – BomLife Private Limited	64
6. Farm Mechanization – IndusTill FarmTech Private Limited	66
7. Smart Electric Tiller – SANDBIRD.....	68
8. Precision Drip Irrigation – MAGBIITY.....	70
9. Crop Specific, Microbial Bio-Products – LCB Fertilizers Private Limited.....	72
10. Soil Testing – Neoperk Technologies Private Limited.....	74
11. Cattle Health Monitoring – Flixdrop Technology Private Limited	76
GROUP B – HEALTHCARE.....	79
1. Assistive Exoskeleton Devices – GenElek Technologies	80
2. Chimeric Antigen Receptor T Cell (CAR T) Therapy: Immunoadoptive Cell Therapy Private Limited.....	82
3. Digital Stethoscope: Ayu Devices Private Limited	84
4. Genomic Test for TB patients: Haystack Analytics	86
5. RT-PCR Kit ‘Om’ for Omicron Variant – CDRI.....	88
6. Bi Level Positive Airway Pressure (BiPAP) System Portable Ventilator – NAL.....	90
7. Asthma Control – Briota Technologies Private Limited	92
8. Vein Tracking – Medtra Innovative Technologies Private Limited	94
9. Portable Pathology Lab and La-Bike-Accuster Technologies.....	96

10. Smart Pill Companion – Maverick Medicare Systems.....	98
11. Non-Invasive Glucometer – Vivalyf Innovations Private Limited	100
12. Cancer Margin Detection – TeraLumen Solutions Private Limited	102
13. Wearable Solutions for Chronic Knee Pain & Spine-ASHVA	104
14. Suitcase OCT – Tishyas Medical Device Development Solutions Private Limited	106
15. Early Diagnosis of CKD – Prantae Solutions Private Limited.....	108
16. Robotics Surgical Intervention Platform – Comofi Medtech Private Limited.....	110
17. 3D Bio-Printer – Avay Biosciences Private Limited.....	112
18. Smart Posture Trainer – Neukelp Innovation Technology Private Limited.....	114
19. Diagnostic Device for Detection of Malaria Chikungunya & Dengue – Ameliorate Biotech.....	116
20. Foetal Genitals – Purplas IT Services Private Limited	118
21. Assistive Oral Care Device – SocioDent Private Limited	120
22. Cardiac Arrest – Inofinity Research and Development Private Limited	122
23. Wound Healing with Biomaterials – Alicorn Medical Private Limited	124
24. Wound Healing Through Silk Proteins – Fibroheal Woundcare	126
GROUP C – WATER & SANITATION	129
1. Low-Cost Arsenic Removal Filter Using Activated Laterite for Drinking Water – IIT Kharagpur	130
2. Ground Water Detection – WaterQuest Hydroresources Management India Private Limited	132
3. Atmospheric Water Generator (AWG) with Remineralization – Maitri Aqatech	134

4. Sewer Cleaning Robot – Gen Robotics	136
5. Fertilizers from Urine – Waste Chakra.....	138
6. Waste Water Treatment – Indrawater.....	140
7. Water Management – Kritsnam Technologies	142
8. Water Testing – Elico	144
9. E.coli Test Kit – Earthface Annalytics Private Limited	146
10. Recirculating Aquaculture Systems (RAS) – Oriental Aquamarine Biotech.....	148
11. Pipeline Inspection Robots – SOLINAS.....	150
12. Textile Reinforced Concrete Prototyping Technology (TRCPT) – CSIR-SERC.....	152
13. Colourful Pavement Tiles from Waste Plastic – CSIR-NPL	154
14. Extraction of Cobalt Metal/Salt from the Black Powder of Li-Cobalt Batteries – CSIR-NML.....	156
15. Oner Water Disinfection System – CSIR-IITR.....	158
GROUP D – DEFENCE & AEROSPACE	161
1. Anti Drone System – Zen Technologies	162
2. Indian Global Navigation Satellite System (GNSS) – Accord Software & Systems.....	164
3. India’s AR-Enabled Smart Helmet For Higher Security and Surveillance – AjnaTX Helmet	166
4. Unmanned Tank – Big Bang Boom Solutions (BBBS)	168
5. Green Propulsion System – Manastu Space	169
6. Bullet Proof Vest With Graphene Composite Materials – Nanospan	171
7. Electric Propulsion Systems for Low Cost Satellite Launch Vehicles – Bellatrix Aerospace.....	173
8. Satellite Launch – Agnikul Cosmos Private Limited.....	175
9. Thermal imaging – TONBO IMAGING.....	177

10. Smart Buoy – Saif Automations Services LLP	179
11. High Altitude Pseudo Satellite (HAPS) UAV – NewSpace Research & Technologies Private Limited.....	181
GROUP E – INDUSTRIAL PRODUCTS	183
1. Indian 5G Technology – WiSig Networks.....	185
2. AUM (Air Unique Quality Monitoring) – CATS-CASTLE Advanced Technologies and Systems	187
3. Flash Memory – Sahasra Semiconductors Private Limited (SSPL).....	189
4. Plug and Play Mobile ESS – AmpereHour Energy	191
5. Robot for Cleaning Solar Panels – Enray Solutions	193
6. Autonomous Vertical Profiler (AVP) – NIO	195
7. Pothole Repair Machine – CRRI-CSIR.....	197
8. Solar PV Module – Sunora Solar	199
9. Roads with Plastic Waste – Prof. R Vasudevan	201
10. Bioleaching Based Gold Extraction from E-waste – Neshaju Envirotech.....	203
11. Veterinary Life Saving Temperature Regulating Machine – Thermodrip	205
12. Making Exiting Air Conditioners Energy Efficient – SMDPower Solutions (OPC) Private Limited.....	207
13. Products from Carbon – Carbon Craft	209
14. Worker Safety – Hacklab Solutions Private Limited	211
15. Facial Recognition App – MUKHAM.....	213
16. Touchless Technology – Hindonics Technologies Private Limited	215
17. Smart Factory – Insightzz.....	217
18. Digital Manufacturing Platform – MEKR.....	219
19. Drones for Mine Management – Aarav Unmanned Systems	221

20. HPC Server – CDAC and VVDN.....	223
21. Nanofiber Solutions – E-SPIN NANOTACH	225
22. Semiconductor Products – Saankhya Labs Private Limited	227
23. Low Temperature Evaporation Technology – Spray Engineering Devices Limited (SED)	229
GROUP F – CONSUMER PRODUCTS	231
1. Double Fortified Salt – CSIR-CSCMRI.....	232
2. Self-Heating Technologies – Anchiale	234
3. Home Appliances Powered by the BLDC Motor – Atomberg Technologies	236
4. Super-Efficient Ceiling Fan – Super Fan	238
5. A Mechanical Automatic Urinal-Toilet Flusher – NEERI	240
6. Smart Intelligent Assistive Care Convertible Tech System for Safe Handling and Transfer of Patients – Coin Medix Private Limited	242
7. Paper Bag that Can Carry a Weight Upto 10kgs – La Fabrica Craft Private Limited	244
8. Vehicle Engine Performance Monitoring – HiPER	246
9. Solar Induction Cooker – Oxy Neuron India Private Limited	248
10. Robotic-Assisted & Data-Driven Physiotherapy – Punar	250
11. Diabetic Monitoring With Smart Socks – Feetwings.....	252
12. Hygiene Management – Microgo.....	254
13. Air Purifier – Medcuore Medical Solutions.....	256
14. Zinc-Based Battery (ZincGel) – Offgrid Labs Private Limited	258
15. Germ Destroying Air Filters – AiRTH.....	260
16. Audio Products – MiVi	262

ECOSYSTEM: PUBLIC-PRIVATE-MEDIA

Startup India



The Indian Startup landscape has shown tremendous growth over the past decade and has become the third-largest startup ecosystem in the world. Today 75,000 startups are registered with DPIIT (Department for Promotion of Industry and Internal Trade (DPIIT)), the nodal department for startups in India.

Incubators are facilitators that help startups grow their businesses, especially in the early stages. An Incubator is like a college for startups. Their focus is to provide support to startups in the form of providing financial assistance, workspace, training, networking, mentoring, marketing, and business management opportunities. Incubators can be State-funded or private, and within various Higher Education Institutions (HEIs). India today has 600+ active incubators, 60 Atal Incubation Centres and large number of accelerators. Startup accelerators provide support to startups in their growth stages. This is usually done through a cohort-based program, providing support

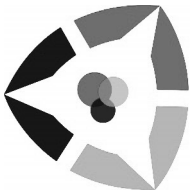
through education, mentorship, and funding. Acceleration programs usually culminate in a graduation or demo day. These programs are organized by corporates, incubators, State and Central Governments, and even HEIs. There are numerous accelerators in India, more than 150 of which are registered on Startup India Hub.

Startup portal is India's largest online entrepreneurship platform that allows startups to network, access free tools & resources and participate in programs & challenges. From the portal one can connect with about 50,000 startups, investors, incubators, accelerators, mentors and government bodies. There is knowledge bank for startups, partnered services, templates, online courses and innovation challenges.

DPIIT recognition entitles startups for fast track patent process, income tax exemption and easier public procurement.

Web Page: <https://www.startupindia.gov.in/>

Defence Innovation Challenges



iDEX Innovations for
Defence Excellence
PM Awardee 2021

Defence and aerospace are strategic sectors under ‘Make in India’ and provide a big opportunity for startups and entrepreneurs to venture in this sector. Ministry of Defence aims to create an ecosystem which fosters innovation and encourages technology development in Defence by engaging R&D institutes, academia, industries, startups and even individual innovators. For bolstering this aim, *industry funded Make II*, *iDEX*, *Dare to Dream*, and *Technology Development Fund* have been launched, a Defence Investor Cell has been opened, TReDs has been implemented, apart from several other initiatives, which are embraced by young talents all over India.

Innovation for Defence Excellence (iDEX), launched by Department of Defence Production in the Ministry of Defence in April 2018, has created huge interest in startup community to work in this reclusive sector. The Defence India Startup Challenges have brought over 500 startups which are today active in this space. The iDEX Partner Incubators have enabled Department of Defence Production to reach out to startups in all nooks and corners of the country. The progress has been extremely heartening and encouraging. Indian startups are marching strongly to occupy a place of pride in the innovation advancement in the global defence and aerospace sector.

Defence India Startup Challenge (DISC 1) was launched on 4th Aug 2018. Approximately 500 applications were received in the first leg of the challenge, of which a total of 28 Winners have been shortlisted to be considered for grant of funds for prototype development and possible commercialization thereafter. In 2019 DISC-II was launched

with four Problem Statements in domains such as Avionics, Drones, GPS based equipment and Radars and 28 applicants were selected. In addition to DISC series, IDEX PRIME was launched in 2022 with an increased grant amount of Rs. 10 cr.

Government also reserved 25% of research and development budget for projects spearheaded by startups and private companies. This is in addition to 68% capex acquisition budget for weapons purchases from the domestic market

Web Page: <https://idex.gov.in/contact-Us>

NIDHI-PRAYAS, DST



National Initiative for Developing and Harnessing Innovations (NIDHI) is an umbrella programme conceived and developed by the Innovation & Entrepreneurship division, Department of Science & Technology, Government of India, for nurturing ideas and innovations (knowledge-based and technology-driven) into successful startups. The programme would work in line with the national priorities and goals and its focus would be to build an innovation driven entrepreneurial ecosystem with an objective of socioeconomic development through wealth and job creation.

Popular programs are:

1. NIDHI-GCC - Grand Challenges and Competitions for scouting innovations;
2. NIDHI-Promotion and Acceleration of Young and Aspiring technology entrepreneurs (NIDHI-PRAYAS) - Support from Idea to Prototype;
3. NIDHI- Entrepreneur In Residence (NIDHI -EIR) - Support system to reduce risk.

Status:

Total PRAYASEE supported-1045

Prototypes developed- 419

Patents filed- 372

Follow on funding raised- Rs. 248 crore

Number of incubators approved as PRAYAS Centres-44

Prototype grant amount is capped at Rs. 10 lakhs while NIDHI - EIR Programme will support idea stage, product - focused young entrepreneurs with a fellowship support of maximum Rs.30,000/- per month.

The program is managed by SINE, IITB

Web Page: <https://nidhi-prayas.org/>

Biotechnology Ignition Grant Scheme (BIG), DBT



THE PURPOSE OF THE BIG SCHEME IS TO:

- Foster generation of ideas with commercialisation potential
- Upscale and validate of proof of concept
- Encourage researchers to take technology closer to market through a start up
- Stimulate enterprise formation
- As part of this scheme, successful BIG Innovators receive up to INR 50 lakh (USD 70,000 approx) for research projects with commercialization potential with duration of up to 18 months.
- The call for proposal is announced twice a year, i.e. on 1st January and 1st July. Call for proposals typically remains open for about 45 days.
- The BIG Scheme is currently managed through 8 BIG Partners across the country who works with the Ignition grantees (BIG Innovators) to provide mentoring, monitoring, networking and other business development related activities.

Status:

Proposals supported: 500+

Startups created: 125

IPs filed: 120

Prototypes developed: 50+

Funds committed: Rs. 250 crores

Web Page: <https://birac.nic.in/big.php>

MANAGE-CIA



Centre for Innovation and Agripreneurship

The National Institute of Agricultural Extension management (MANAGE)-Centre for Innovation and Agripreneurship (CIA) is a Centre of Excellence in Agribusiness Incubation hosted at the National Institute of Agricultural Extension Management (MANAGE). It is one of the leading Agribusiness Incubators in India. MANAGE-CIA has mentored 450 plus entrepreneurs incubated more than 300 startups from various focus areas of the Agri & Allied Sectors.

It is also the Knowledge Partner under Innovation and Agri Entrepreneurship initiative of the RKVY-RAFTAAR project. As a Knowledge partner under RKVY-RAFTAAR, MANAGE-CIA has the responsibility of hand holding four R-ABIs namely, ICAR-Indian Institute of Millets Research (IIMR), Tamil Nadu Agricultural University (TNAU), Coimbatore, Tamilnadu, Kerala Agricultural University (KAU), Vellanikkara, Thrissur, Kerala and Acharya N G Ranga Agricultural University, Tirupati, Andhra Pradesh.

RKVY-RAFTAAR: Program under Ministry of Agriculture & Farmers Welfare, a financial assistance program with maximum of ₹25 lakhs will be granted to potential startups that have a minimum viable product (MVP) based on innovative solutions/processes/products/services/business models in agriculture and allied sector. Agripreneurship orientation program provides 2 months training and eligibility for Rs. 5 lakh grant. Under this program nationally near 18000 projects were sanctioned and 8700 projects completed. This is India's largest program where huge funds were committed in 16 years.

Pre-Incubation Mentoring Program –The program is a 22 Day capacity building training program for aspiring Agripreneurs & Startups. The program consists of 30 hour sessions spread across 15 days followed by one on one hand holding sessions for a week. It's one of its kind

paid programs enables Agripreneurs to move from idea to MVP Stage while developing a sound understanding of the business, the skills, challenges, and opportunities.

MANAGE-Samunnati Agri Start-up Awards is a platform that aspires to recognise such impact-driven Agri and Ag-tech startups dedicated to re-imagining, renewing, and rebuilding the ecosystem giving cash prizes at national level and also at state level.

Web Page: <https://www.manage.gov.in/MANAGECIA>, <https://rkvy.nic.in/>

Technology Incubation and Development of Entrepreneurs (TIDE) 2.0



Ministry of Electronics & Information Technology (MeitY), Government of India is leading and facilitating a gamut of Innovation and IPR related activities across the country towards expansion of this ecosystem. In order to facilitate MeitY's vision of promoting technology innovation, start-ups and creation of Intellectual Properties, a nodal entity called 'MeitY Start-up Hub' (MSH) has been setup under its aegis. MSH will act as a national coordination, facilitation and monitoring centre that will integrate all the incubation centres, start-ups and innovation related activities of MeitY.

Technology Incubation and Development of Entrepreneurs (TIDE 2.0) Scheme has been envisaged to promote tech entrepreneurship through financial and technical support to incubators engaged in supporting ICT startups using emerging technologies such as IoT, AI, Block-chain, Robotics etc. in seven pre-identified areas of societal relevance. The Scheme will be implemented through 51 incubators and handholding of approximately 2000 tech start-ups over a period of five years. It will support tech startups addressing societal challenges in seven selected thematic areas identified based on national priorities.

Grand Challenges is an initiative of MeitY Startup Hub to drive new tech-driven business models and rapidly scale up prototyping of technologies. It's a "win win" scenario with MSH able to scan new and

disruptive innovation ideas coming out from startups and accurately profile emerging technology landscapes while startups receiving funding and recognition. Challenges range from ‘*Suggest a Name for Digital India Startup Hub (DISH)*’, to “*BuildForBharat IoT Startup Challenge*”.

Support for international patent is another unique scheme of MeitY. In order to encourage filing of International Patents, a Scheme Support International Patent Protection in Electronics & IT (SIP-EIT) has been put in place. The Scheme Supports International Patent Protection in Electronics & IT by SMEs (Small and Medium Enterprises) and Technology Start-Up Companies.

Web Page: <https://meitystartuphub.in/incubators/incubation-centres-wall>

INNOVATION

AUM - a portable, photonic system for real time, remote, air pollution monitoring, capable of measuring all known pollutants in air at parts per billion level (ppb) concentrations.

INNOVATOR



Prof. Rao Tataavarti, DRDS, FOSI, FAPAS
M.S. (IIT Madras), PhD (Dalhousie University, Canada)

Distinguished Professor & Director
GVP College of Engineering & GVP-SIRC
Madhurawada, Visakhapatnam 530048, INDIA.
e-mail: rtataavarti@gmail.com
Mobile: +91 9490760658

COMMERCIALIZATION / LICENSING

Mr. Biren Shah
CATS Eco Systems Private Limited
2nd Floor, Shirin Villa, Shalimar,
Nashik 422401, INDIA
e-mail: b.shah@cats-global.com
Mobile: +91 9371578575

AUM (Air Unique Monitoring) is a photonic system capable of remote monitoring of air quality in real time, indigenously designed and developed by **Prof. Rao Tatavarti** (rtatavarti@gmail.com) and his team, with support from the Clean Air Research Initiative of DST, Government of India.

The indigenous system, AUM was demonstrated to have many unique characteristics capable of real time remote monitoring of air quality. The uniqueness and novelty of the AUM photonic system lies in innovatively applying the theories of laser back scattering, opto-electronics, statistical mechanics, artificial intelligence, and machine learning to identify, classify and quantify various air pollutants simultaneously, with high accuracy and sensitivity. Additionally, AUM photonic system instantaneously communicates encrypted digestible pollution information to the remote command/control server or a user using state of art wireless internet, and encryption technologies.



AUM photonic system has several unique characteristics and offers many merits over the current imported and expensive air quality monitoring systems:

- *Detection and discrimination of pollutants (all gases and VOCs) in addition to environmental parameters like air temperature, pressure, density, humidity, and wind speed* - with high accuracies and sensitivities range from environmental factors to various gases and VOCs at *ppb* level concentrations.
- *Monitoring at very high sampling rate* - system has a low time response and can collect 10,000 data points *per second*. This can be helpful in precisely monitoring at a single location in space, or along a spatial range in 3-D space.
- *Plug and Play* - traditional systems requires pre-heating time and '*setting up*' time. The photonic system can be powered and used immediately.
- *Not limited to specific gases* - traditional systems uses techniques that are based on adsorption and tend to be more reactive and specific to one of the gas species. The photonic system can be used to determine all gases (pollutants), as every gas (pollutant) has a unique backscattering signature. Even isomers of gases can be detected and discriminated at *ppb* concentration levels.
- *Comprehensive solution for complete air quality monitoring* - the system can monitor all the parameters of indoor air/outdoor air/flue and fugitive gases. Whereas, in most other cases multiple systems need to be employed for the same purpose.
- *Non-Intrusive and in-situ monitoring* - system uses light backscattering and thus, need not to be mounted on/inside the measurement sample. Can be placed far outside, but just pointing towards the desired location from 10m to 1000m. In contrast, most other sensors work by direct collection of samples and are intrusive.

- *Standalone universal calibration facility* - enabling the system for universal calibrations, so that the system can be deployed immediately in any geographical location in the world - from poles to equator.


The indigenously developed photonic system AUM can continuously monitor the different gases in-situ, thus enabling:

- *Ambient air quality & pollution monitoring in Cities and in Industries*
- *Emission monitoring from Stacks/ Chimneys / Vehicles / Ships etc.*
- *Opacity determination for various applications by monitoring particulate matter, hydrocarbons in air.*
- *Determination of leakages and fugitive gases by monitoring gases emitted by various chemical industries.*
- *Industrial fire and safety monitoring.*
- *Weather monitoring for hyperlocal temperature, pressure, humidity, density, and wind information.*
- *Gas analysis for determining the quality of gas in pipeline during operational processes.*
- *Indoor air quality monitoring for determining ventilation, thermal effectiveness, and efficacy of cleanrooms.*

Commercialization of indigenous development - The cost of the standard imported systems is more than four to five times and involves setting up civil infrastructural facility. The AUM system is not only very economical and portable, but also does not require setting up. The technology transfer partner **CATS Eco Systems Pvt. Ltd.**, a Nashik, India based MSME, registered under *Startup India* initiative, had supplied a couple of systems to WEBEL / WBPCB, Kolkata. Major orders from various municipal corporations under NCAP Program, are also in the pipeline. For commercial enquiries, please contact Biren Shah (b.shah@cats-global.com).

Business / Market Potential - The cumulative market size for all the above applications, is expected to reach a staggering USD 4.5 billion by 2024, at a CAGR of 3.8% during the forecast period. (2019 - 2024). The potential of securing global business is a minimum 10% of market size. This would therefore promote India's share in global market and can also be very significant for long term, in sync with *Atma Nirbhar Bharat Abhiyan* of the government.

Recognitions for AUM

 <p>Indigenous Air Unique-quality Monitoring Photonic System developed for real time remote monitoring of air quality</p> <p>STORY NO 53</p> <p>To know more visit AatmanirbharBharat.MyGov.in</p>	<p>Prime Minister of India, Hon. Narendra Modi on January 4, 2021, @NPL, CSIR New Delhi</p> <p><i>“Still, for technology and tools for measuring air quality and emission, India is dependent on others. The indigenous achievement (AUM) will lead to self-reliance in the field and will lead to creation of more effective and cheaper tools for pollution control.</i></p> <p><i>This will also enhance India's share in the global market for technologies related to air quality and emission technology. We have achieved this by the continuous efforts of our scientists”</i></p>
--	---