Office of the Principal Scientific
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From the Office of the PSA

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India in Focus

75 Years of Indian Science and Technology: A Mission in Sustainability and Self-Sufficiency

— Rachana Bhattacharjee

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Industry–Academia Engagement

Manthan: A Digital Platform for Research and Innovation Through Collaboration

— Krittika Sengupta

On 15th August 2022, Prof. Ajay Kumar Sood, Principal Scientific Adviser (PSA) to the Government of India, launched the Manthan Platform—the creation of which, he declared, was *"a pivotal step in building, nurturing, and celebrating the outcome of partnerships between various stakeholders of science, technology, and innovation ecosystems in India."*

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Office of the Principal Scientific Adviser to the Government of India

Manthan
Ideas and implementation through Science, Technologies, and Innovations

The official logo of the Manthan platform
Image credits: Office of the PSA

Science and Technology Clusters

Event Report: Bridging Workshop on CSR Grants to Strengthen Academia–Industry Partnership in Delhi–NCR

— Dr. Adita Joshi

A key role of science and technology (S&T) clusters is to spearhead academia–industry engagements to address major industrial, environmental, and societal challenges. Fulfilling this role, the Delhi Research Implementation and Innovation (DRIIV), which is the Delhi S&T cluster under the Office of the Principal Scientific Adviser (PSA) to the Government of India, has embarked upon creating such a collaborative network towards fostering research and development (R&D) activities through an interdisciplinary approach.

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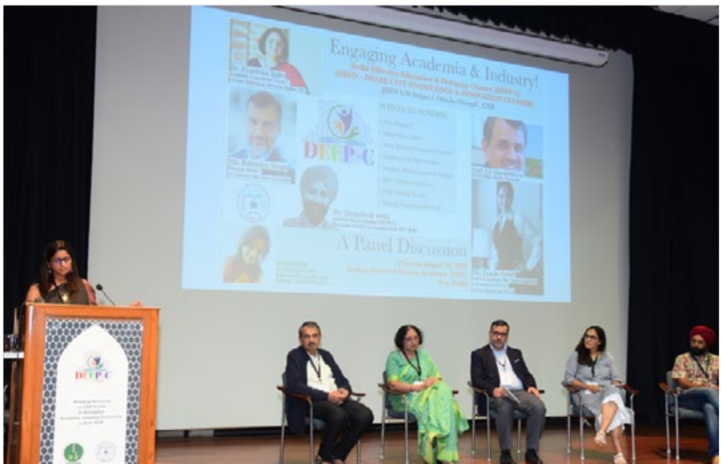

Panel discussion on "Bridging the academia–industry gap." Panel experts from left to right: Prof. L. S. Shashidhara, Dr. Pratibha Jolly, Balinder Singh, Prachi Pandit, and Dr. Tavpritesh Sethi; with Dr. Gitanjali Yadav as moderator.

INDIA IN FOCUS

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75 Years of Indian Science and Technology: A Mission in Sustainability and Self-Sufficiency

— Rachana Bhattacharjee

At the start of India's 75th year of Independence, Dr. Jitendra Singh, Minister of State (Independent Charge) for the Ministry of Science and Technology and Earth Sciences, said, *"We are a frontline nation in various fields in the world, and a lot of credit for this goes to the hard work and dedication of our scientific fraternity. They have contributed enormously to India's rapid ascent in the last 75 years."* A year later, as India celebrated the completion of 75 years of Independence and looked towards the future with new inspiration, this pride in the nation's achievements, this belief in the country's people, continued to ring true.

Indeed, in 1947, after a war for independence, India found itself socio-economically broken and in need of rapid reconstruction. The government and the people came together across various fields, and through policy and innovation, step by step, India grew stronger, achieving many milestones and becoming recognised globally.

The foundations

The story broadly begins with the formulation of the first 5-year plan in 1951, which focused on agriculture, science, infrastructure, and education, and importantly, on laying the foundation for fundamental research. Over the first few decades, India built and improved academic institutes, laboratories, and research centres across the country. To augment these efforts and provide direction to the research in the country, several government organisations were also set up, such as the Council for Scientific and Industrial Research (CSIR) in 1942, the Department of Atomic Energy (DAE) in 1954, Defence Research and Development Organisation (DRDO) in 1958, the departments of Electronics and Science and Technology in 1971, Department of Space in 1972, and Department of Environment in 1980. In addition, in 1976, another crucial step was taken: India adopted a "scientific temper" in its Constitution, declaring the development of a scientific temper, humanism, and the spirit of inquiry to be the duty of every Indian citizen.

Agriculture

By 1976, India had already achieved two major milestones in self-sufficiency, the Green Revolution and White Revolution. In the 1960s, research on high-yielding wheat varieties at the Indian Agriculture Research Institute, supported by the indigenous development of technology such as tractors and agri-pesticides by CSIR and Indian Council of Agricultural Research (ICAR), helped India increase its wheat and rice production significantly. This enabled the country to move away from large-scale imports permanently. At the same time, Dr. Verghese Kurien and his team at Anand, Gujarat, revolutionised the milk industry and removed the need for milk imports by proving, for the first time in the world, that buffalo milk could be processed and stored as milk powder. Dr. Kurien was instrumental in creating nationwide dairy cooperatives that ensured no milk went to waste.

This was followed by the Yellow Revolution and Blue Revolution in the late 1980s, which boosted the production of edible oilseeds and made India the second largest fish producing country, respectively. In the 1990s came the Golden Revolution, which aimed at scaling up honey and horticultural production.

Through these years and into the 21st century, India has grown to become self-sufficient in the cultivation of various spices, medicinal plants, and aromatic plants that are an important presence in Indian culture and lifestyle, such as asafoetida, mentha, lavender, and saffron. And true to a legacy that began with the Green Revolution, India continues to advance in agri-genomics and genome editing to improve yields and adapt farmed varieties to the changing times.

Defence

The 1960s—the time of the Green Revolution—is also the decade in which India reached its first defence milestone: the launch of the first indigenous naval submarine, INS Kalvari. This was the start of a long list of 'Made-in-India' technologies not just in defence but across fields. However, in the defence sector, India went on to successfully build, test, and deploy the Agni and Prithvi missiles, supersonic fighter aircrafts such as Tejas, nuclear missiles (Pokhran II), the world's fastest supersonic cruise missile of its kind BrahMos, ballistic missile submarine INS Arihant, and aircraft carrier INS Vikrant, to name a few. These have been possible through the indigenous development, often from scratch, of individual state-of-the-art technologies for defence aircraft and equipment components, such as Autoclave Technology to process lightweight composites used in modern-day civil and military airframes, and head-up displays (HUDs).

In addition to aircraft, missiles, and submarines, there have been several other key developments in the recent past, such as the anti-satellite technology developed under Mission Shakti, which has made India the 4th nation to demonstrate this capability based on indigenous technology; Astra, the first indigenous beyond visual range air-to-air missile, which has placed India among a select few nations that possess this technology; the ATAGS 155 mm gun, which has the longest firing range in the world; radars like the weapon locating radar Swathi and low-level tracking radars for applications in mountains; electronic warfare systems; underwater weapons and countermeasure systems; and drones and anti-drone systems.

At present, the DRDO is conducting research on ways to integrate technologies such as quantum systems, hypersonic systems, advanced materials, and artificial intelligence into the defence sector. In fact, the Hypersonic Technology Demonstrator Vehicle (HSDTV) was successfully tested in 2020, making India the 4th country to showcase the use of this technology.

Space

The space sector is another area where India has built technology indigenously and received global recognition. This saga begins in 1975 with the launch of Aryabhata, the first Indian satellite—which was equipped with instruments for conducting experiments in x-ray astronomy and solar physics—and the launch of SITE (Satellite

Instructional Television Experiment), which brought community TV sets even in remote areas of India. These, and later, the launch of the Indian National Satellite (INSAT) and Indian Remote Sensing Satellite (IRS) in the 80s, ushered in an era of prosperity through mass communication, remote sensing, weather prediction, atmospheric and space research, and more.

In 1980, India successfully launched its first Satellite Launch Vehicle, SLV-3. In 1984, India sent Rakesh Sharma, its first astronaut, into outer space. In the 2000s, India began to build its own rockets, which not only carried indigenous satellites and research instruments, but also sent instruments from other developed nations into space. Notable among missions run by Indian rockets are Chandrayaan 1 (India's first mission to the moon; through which India became the 4th country to send a probe to the lunar surface; and in which, India made the pathbreaking discovery of water molecules on the lunar surface), the Mars Orbiter Mission (where India became the first nation to enter the Martian orbit in its maiden attempt), launch of GSLV-D5 (which was powered by the first Indian made cryogenic engine), and the world record set by successfully placing 104 satellites in orbit during a single launch.

In addition to these missions, in the 21st century, India continues to develop its space sector through the creation of organisations like the Indian National Space Promotion and Authorization Centre (IN-SPACe) under the Department of Space, to promote greater private and citizen participation in the sector—this has led to the successful launch of four student satellites—and institutes to train engineers for the Indian Space Programme, such as the Indian Institute of Space Science and Technology in Thiruvananthapuram.

In the coming years, India is gearing up for several ambitious missions, including a soft landing on the moon (Chandrayaan 3), a human spaceflight mission (Gaganyaan), a solar mission (Aditya L1), and a Venus orbiter mission (Shukrayaan). In an exclusive interview for the PSA Office, Mr. S. Somnath, Secretary, Department of Space (DoS) and Chairperson, ISRO, talked about how these missions *"define our identity as a technology-creating nation striving to lead one of the most powerful and influential space programmes in the 21st century world."* The nation also remains immersed in research to build small satellite launch vehicles, air-breathing rocket propulsion systems, reusable rocket technology, and more. *"These missions are opportunities to train a young scientific workforce that looks beyond routine tasks and drives fundamental knowledge creation. We aim to involve engineers, mathematicians, astronomists, astrophysicists, and entrepreneurs for building capacity for national missions and commercial economic ventures,"* said Mr. Somnath.

Societal welfare and sustainability

From the 1980s and 90s, India made many achievements in various fields of science and technology where progress was focused solely on improving lives on the ground. At the turn of the decade in the 80s, India adopted Mark-II handpumps across rural areas, countering drought in a major way. In 1983, the first Indian scientific base station was set up in Antarctica. In 1984, the setting up of C-DOT (Centre for Development of Telematics) pooled the nation's telecom researchers and resources under one roof, kickstarting the telecom revolution. In 1986, the first Railway passenger reservation system was set up, which was the largest such project demonstrating the application potential of information technology.

The year 1986 also marked the birth of the country's first test tube baby, Harsha; this feat, in combination with the pioneering of in vitro fertilization by the Indian Council of Medical Research (ICMR) earlier in the decade, placed India on the world map in the field of assisted reproduction. In 1991, DNA fingerprinting was first used as evidence in a legal dispute—opening doors to new possibilities in forensics, genome research, and genetic testing in healthcare—and PARAM, India's first supercomputer, was built. In 1998, Kalpakkam, India's nuclear power generation and fuel reprocessing plant, was established.

Kalpakkam has gone on to achieve considerable significance in terms of the nation's sustainability goals in the decades since its opening. Recently, it became the location for two water desalination plants built by DAE, which supply potable water to a nearby township. It is also the location for a novel sewage treatment plant by DAE. In a way, it is becoming the site that recalls the wide array of research work that the DAE conducts, from developing research nuclear reactors to discovering effective isotopes for radiotherapy, and inventing low-cost water purification systems that require no electricity.

Heading into the 21st century, India conducted its first electronic-voting-machine-based elections in 2004; developed Aadhar, a unique identification number for all residents, in 2009; was declared polio-free in 2014; and set up an arctic observation station, IndARC, in 2015. In the 2020s, the momentum continues with the development of a hydrogen-powered car, the first indigenous social humanoid robot, the first indigenous server RUDRA, a manned submersible Samudrayan, and indigenous COVID-19 vaccines, among other innovations.

Today, India has to its credit several indigenous diagnostic kits, including those for HIV; several vaccines, such as those for rotavirus, multibacillary leprosy, dengue, malaria, chikungunya, and influenza; drugs, such as anti-fungal compositions and affordable generic versions of western brands; and medical devices, such as Sohum, for the early detection of hearing impairment in children, and NeoBreath, a foot-operated resuscitation device for neonatal care. These, supported by healthcare-focused policies, have contributed greatly to the improvement in life expectancy from 32 years in 1947 to 69.4 years in 2021. They have also helped reduce maternal mortality from 2000 to 113 per 100,000 live births and infant mortality from 145 to 28.7 per 1000 live births, during the same time period.

Overall, India is one of the top nations in terms of renewable energy installations, has nurtured the 3rd largest start-up ecosystem in the world, and houses the world's largest vaccine producer. The nation is well-known globally for participation in international mega-science projects such as the Laser Interferometer Gravitational-Wave Observatory (LIGO), Large Hadron Collider (LHC, CERN), International Thermonuclear Experimental Reactor (ITER), and Square Kilometre Array (SKA).

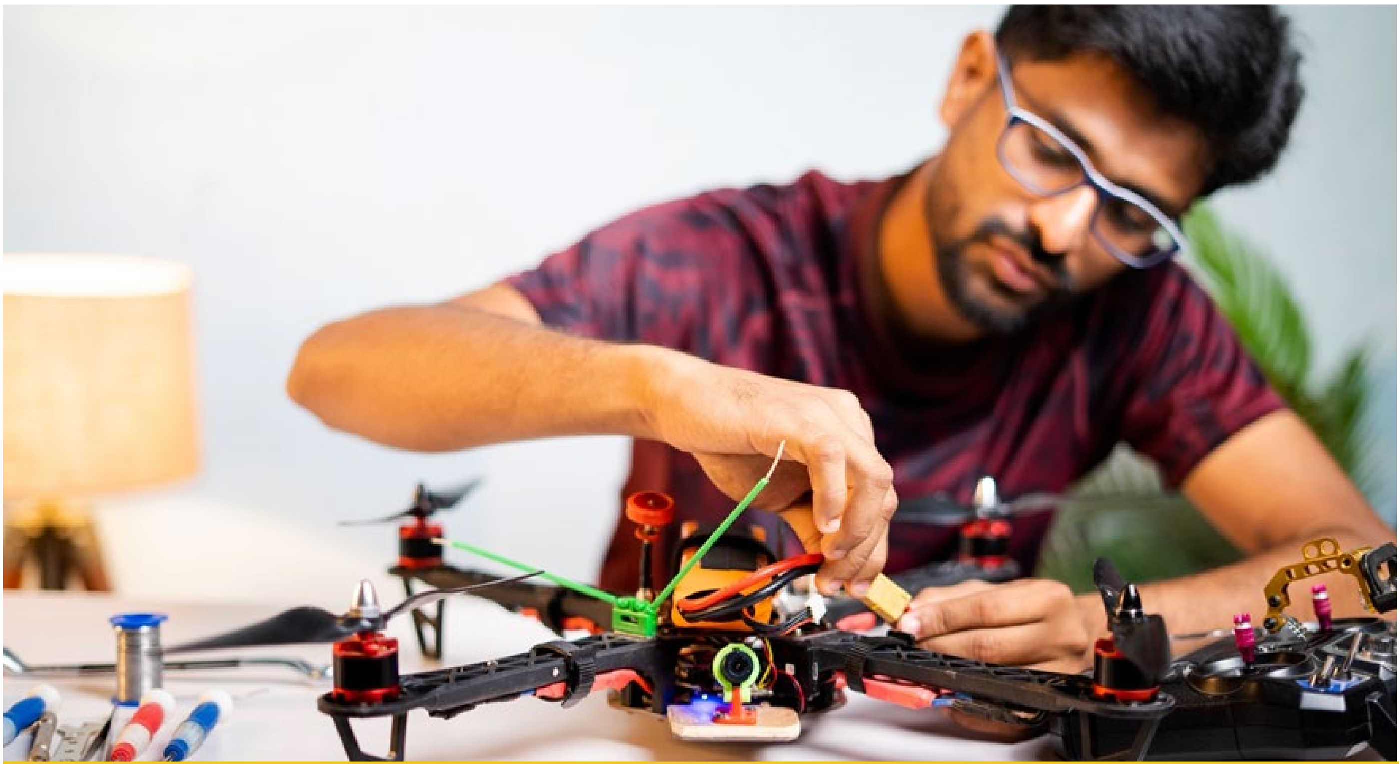
On the road to India@100

The foundations set up in the early years after independence—which have been bolstered and upgraded through the establishment of new institutes and laboratories, new and evolving policies and initiatives, and new targets in the form of national goals—have played a crucial role in setting the nation's course towards self-reliance and sustainability, resulting in the achievements we celebrate today.

With these achievements have come learnings, skill, and development, which have prepared us to take on the grand challenges that remain to be solved in our country. Now, at the beginning of what the Hon'ble Prime Minister of India, Shri Narendra Modi, has termed 'Amrit Kaal'—or the auspicious era of the 25 years remaining until India@100—several cogs have already been set in motion towards achieving India's developmental goals. The Atal Innovation Mission has set up incubation centres for start-ups in a wide range of fields; scientific exploration missions, such as the Deep Ocean Mission or space missions have opened doors to new discoveries; the Digital India movement has been launched to develop semiconductors, spread the network of optical fibres for 5G to rural areas, and drive transformation in education, healthcare, and agriculture through digitalisation; production-linked incentive (PLI) schemes have been set up to boost manufacturing and bring in technologies from abroad; and progressive policies regarding drones have opened up a myriad of possibilities for goods deliveries, digital mapping, surveillance, and flying taxis. This list is not exhaustive.

In his speech on India's 76th Independence Day, the Prime Minister urged the nation to work towards self-reliance in renewables in terms of harnessing solar and wind energy, producing hydrogen fuel and biofuel, and promoting electric vehicles. He emphasized the need for more sustainable practices in agriculture, such as using nanofertilizers and shifting to organic and chemical-free farming. He also hailed the technological successes of the country and highlighted our power to become a technology hub in the coming decades.

Indeed, it is only on the back of science, technology, and innovation that India will grow to become a force to reckon with on the global stage.



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If you would like to dive into 75 years of Indian science, technology, and innovation in further detail, read the curated list of articles below:

- Science Reporter Issue 2021, http://nopr.niscair.res.in/jinfo/sr/2021/Science%20Reporter%20August%202021.pdf :
- "Some Leaders Who Helped Shape Science in India, and Who Left us Recently" by Prof. K. VijayRaghavan
- "Celebrating 75 Years of India's S&T Journey: Major Recent Contributions of DST" by Ashutosh Sharma, Akhilesh Gupta, and Jenice Jean Goveas
- "From Sounding Rocket to Launch Vehicles: Achievements of Department of Space" by K. Sivan
- "Changing the Tide in Public Health Systems in 75 Years: Role of ICMR" by Balram Bhargava and Rajni Kant
- "The Journey of Building Defence Technological Capability" by G. Satheesh Reddy
- "75 Years of India's Independence and 80 Years of CSIR" by Shekhar C. Mande, Geetha Vani Rayasam, and G. Mahesh
- "Indian Agriculture: Journey from Begging Bowl to Sustainable Food Security" by Trilochan Mohapatra and P. K. Rout
- "Department of Atomic Energy: A Proud Symbol of AatmaNirbhar Bharat" by K. N. Vyas and M. Ramanamurthi
- "DBT: Building a Strong Biotechnology Research and Translation Ecosystem" by Renu Swarup and A. Vamsi Krishna
- "Ministry of Earth Sciences: Contributing Towards a Weather-Ready and Climate-Smart India" by M. Rajeevan, Gopal Iyengar, and Bhavya Khanna

- India Today 41st anniversary: A look at science and technology from 1975–2016" by India Today Desk. https://www.indiatoday.in/magazine/cover-story/story/20161226-india-today-41st-anniversary-science-technology-progress-830064-2016-12-15
- "Seven defining scientific contributions that impact every Indian" by Dinesh C. Sharma for Down To Earth. https://www.downtoearth.

org.in/news/science-technology/seven-defining-scientific-contributions-that-impact-every-indian-58467

- "India at 75 | Timeline: Science" by R. Ramachandran for Frontline. https://frontline.thehindu.com/science-and-technology/india-at-75-timeline-science-and-technology-75-years-of-independence/article65731123.ece
- "India's key scientific and technological milestones since independence" by the Ministry of Culture. https://amritmahotsav.nic.in/blogdetail.htm?67
- "India's Scientific Growth Story" by the Embassy of India Moscow. https://www.indianembassy-moscow.gov.in/pdf/snt/India@75%20Science%20Technology%20Innovation%20Growth%20Story.pdf
- "India at 75: High points in science, technology and innovation" by Shekhar Mande for The Hindu. https://www.thehindu.com/opinion/op-ed/high-points-in-science-technology-and-innovation/article65775873.ece
- "IIA explores stellar mysteries over 75 years" by the Department of Science and Technology. IIA explores stellar mysteries over 75 years | Department Of Science & Technology (dst.gov.in)
- "Indian Agriculture After Independence" by H. Pathak, J. P. Mishra, and T. Mohapatra. Indian-Agriculture-after-Independence.pdf (icar.org.in)
- "First in their field: women who led the way" by the Ministry of Culture. https://amritmahotsav.nic.in/blogdetail.htm?74
- "A Brief history of vaccines and vaccination in India" by Chandrakant Lahariya in the Indian Journal of Medical Research. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4078488/#:~:text=The%20Pasteur%20Institute%20of%20India,(OPV)%20in%20197030
- "English Rendering of Prime Minister's Address from the Ramparts of Red Fort on 76th Independence Day" by Pravishti Tithi for PIB Delhi. https://pib.gov.in/PressReleasePage.aspx?PRID=1851994
- "Scientific fraternity in the country celebrated 75th year of India's Independence with the rendering of the National Anthem" by PIB Delhi. https://pib.gov.in/Pressreleaseshare.aspx?PRID=1745501
- Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC). https://www.psa.gov.in/pm-stiac

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Rachana Bhattacharjee is an author, creative lead, and one of countless chroniclers of the information age.

INDUSTRY–ACADEMIA ENGAGEMENT

The official logo of the Manthan platform
Image credits: Office of the PSA

Manthan: A Digital Platform for Research and Innovation Through Collaboration

— Krittika Sengupta

On 15th August 2022, Prof. Ajay Kumar Sood, Principal Scientific Adviser (PSA) to the Government of India, launched the Manthan Platform—the creation of which, he declared, was *"a pivotal step in building, nurturing, and celebrating the outcome of partnerships between various stakeholders of science, technology, and innovation ecosystems in India."*

Manthan is an outcome of the efforts of the Strategic Alliances Division of the Office of the PSA. It is a digital platform that aims to build and nurture relationships between industry and academia so that more challenges can be solved faster and better, to meet India's national targets and the United Nations' Sustainable Development Goals (SDGs). The platform provides a decentralised and democratised environment for easy collaborations between industry, philanthropic organisations, and entities in the scientific research and development (R&D) ecosystem.

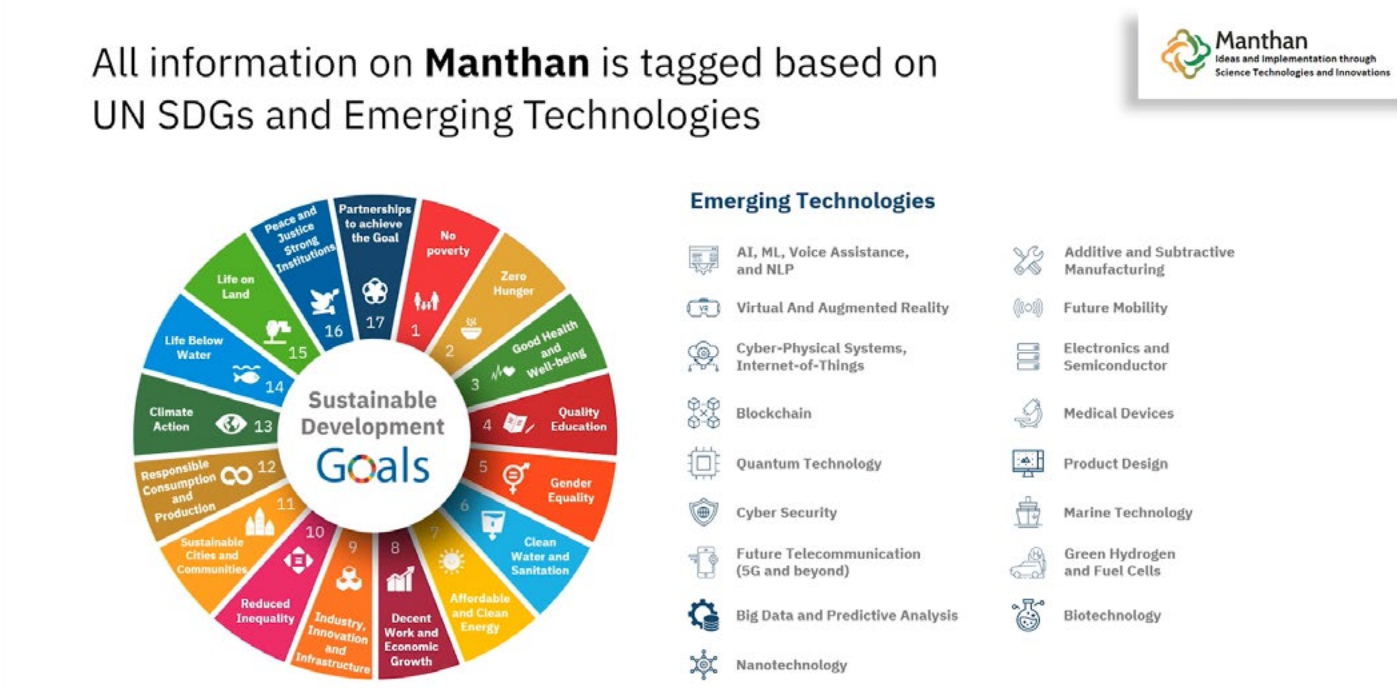
Speaking of how Manthan was conceptualised, Dr. Sapna Poti, Director of the Strategic Alliances Division, said: *"During our work at the Strategic Alliances Division, we brought together various stakeholders through 240 projects worth about ₹1800 crore. But we realised that this is just touching the tip of the iceberg of a huge ecosystem of about 10,94,432 faculty members in premier institutes, more than 3 million researchers, 73,205 start-ups, and so on. So, we thought, how can a 3-member team from the Office of the PSA manage these volumes? That is where the idea of Manthan was born."*

True to the mandate of the Division, Manthan enables demand from multiple industries to feed into the academia and start-up ecosystem, and ensures that research from this ecosystem finds industrial partners willing to apply it on the ground.

One of the key features through which Manthan enables collaboration on a large scale is its straightforward and uncomplicated interface, which makes for effortless navigation and use. For instance, available opportunities are organised into distinct categories, such as the type of SDG impacted or the science, technology, and innovation cluster, making it quite easy for any user to find what they are looking for. The platform also contains preliminary information regarding these opportunities and proposals, access to which does not require user registration. The other key element is that it allows stakeholders to directly communicate with each other, with minimal moderation, thus doing away with the bottlenecks that exist in the physical world.

Sandeep Singhal, Senior Adviser, Aavana Capital, reiterated the latter point during the launch of the platform, citing his experience during the early stages of the COVID–19 pandemic. He talked about how cutting-edge technology and innovations were needed to bridge the supply gap in our healthcare system during that period. As a result, ad hoc partnerships had to be formed. Those partnerships were able to make a great impact; for instance, as Prof. Sood pointed out, they led to the indigenous development of diagnostic kits, reagents, personal protective equipment, mobile labs, ventilators, rapidly deployable extension hospitals, and disinfection technologies. But *"a structured and comprehensive platform like Manthan acts a force multiplier in such situations, connecting institutions or stakeholders having specific innovation requirements to solution providers who can meet their innovation needs,"* explained Mr. Singhal.

It should be noted that Manthan is not the first of its kind. The state of Kerala, in 2020, created a similar, albeit smaller-scale platform named the Research Innovation Network Kerala (RINK), to commercialise innovations from research institutions by connecting them with start-ups and corporates. There is also SanRachna, a multi-domain collaborative platform developed by Bharat Heavy Electronics Limited (BHEL) under the guidance of the Ministry of Heavy Industries (MHI), Government of India, which aimed to provide a one-stop solution to bring together start-ups, entrepreneurs, researchers, and industries. While these have seen success within their domains, neither has the scale that Manthan is aiming for. By integrating with Manthan, the Government of Kerala hopes to achieve its vision of transforming Kerala into a knowledge economy, and BHEL hopes to ramp up technological development and deployment across the board.



The categorization and number of opportunities on Manthan
Image credit: Manthan website

In addition to scale, a crucial feature of Manthan is its ability to sync up with the programming interface of other platforms, while maintaining data privacy and security. This allows for smoother and more secure interaction between stakeholders like philanthropists and funders, who operate through platforms of their own, and whose own function within the research and innovation ecosystem is to drive collaboration. Manthan will help augment their efforts. To quote Bhomik Shah, Founder and CEO of CSRBox, *"This platform has a lot of significance and importance for us at CSRBox—its syncing abilities and privacy maintenance will boost the confidence of CSR and philanthropies to leverage the platform."*

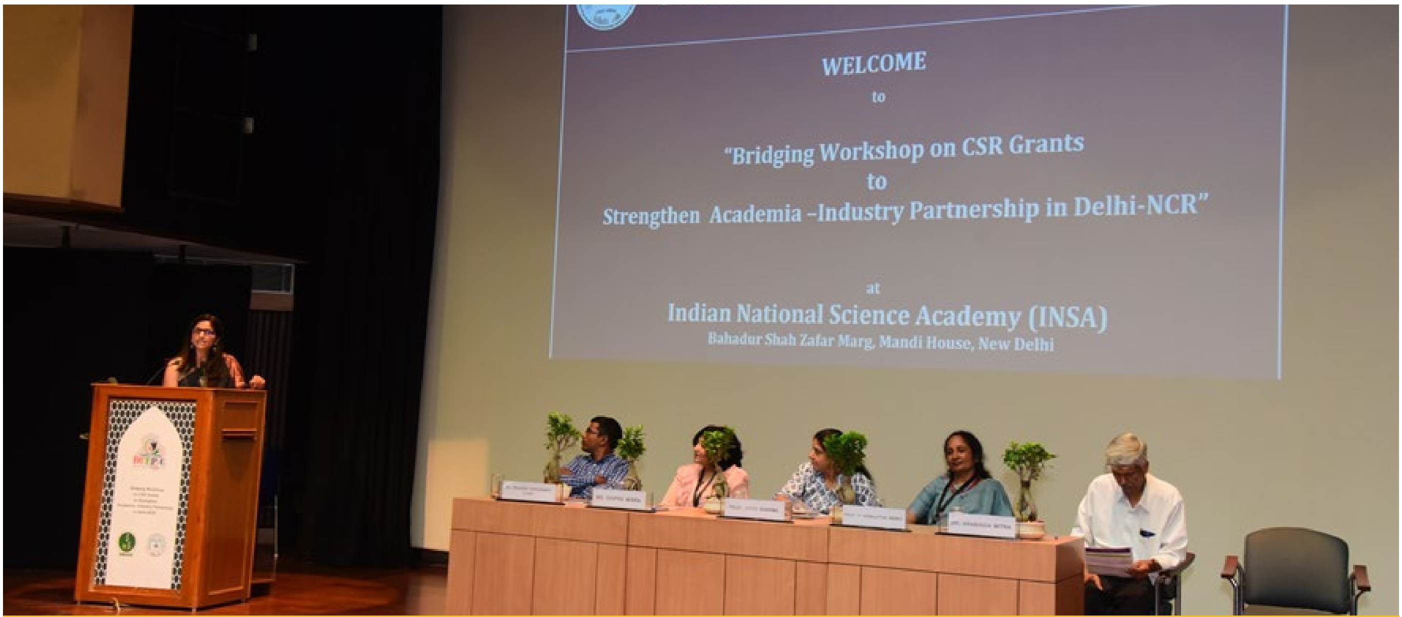
Shah speaks largely of national collaborations. But apart from domestic partnerships, Manthan also aims at promoting international associations. One such partnership is between the Office of the PSA and the Swedish Embassy, to further collaborative research and co-innovation between the two countries. Dr. Wikström, Innovation and Science Counsellor, Embassy of Sweden in India, who was a speaker at the Manthan launch event, mentioned, *"The need of the hour is to have focused interventions in the area of matchmaking [between industry and academia]. My office, along with the Office of the PSA, is working on creating more people-to-people bridges through connecting clusters in both countries....Manthan, as a system and platform, will act as a catalyst here."*

Manthan promises to change the narrative of research and innovation, and the continuous participation and support of all involved stakeholders will be foundational to its success. Today, while significant work in the science and technology system drives the nation, most of the communities doing this work are disparate and operating in silos. Manthan brings this siloed brilliance together to form a single community working towards a common goal—solving India's key challenges and ensuring global recognition of the country's potential.

ABOUT THE AUTHOR

Krittika Sengupta is a part-time content writer and editor, and a full-time content consumer.

SCIENCE AND TECHNOLOGY CLUSTERS



Inaugural session of the workshop. Dr. Gitanjali Yadav is introducing the speakers. From left to right: Chair, Dr. Pradeep Kumar Choudhury, Shipra Misra, Prof. Jyoti Sharma, Prof. Hemalatha Reddy, and Dr. Arabinda Mitra.
Image credits: DEEP-C

Event Report: Bridging Workshop on CSR Grants to Strengthen Academia–Industry Partnership in Delhi–NCR

— Dr. Adita Joshi

A key role of science and technology (S&T) clusters is to spearhead academia–industry engagements to address major industrial, environmental, and societal challenges. Fulfilling this role, the Delhi Research Implementation and Innovation (DRIIV), which is the Delhi S&T cluster under the Office of the Principal Scientific Adviser (PSA) to the Government of India, has embarked upon creating such a collaborative network towards fostering research and development (R&D) activities through an interdisciplinary approach. Recently, Delhi Effective Education and Pedagogy Cluster (DEEP-C), the education vertical of DRIIV created during the pandemic, organised its first physical event called, "Bridging Workshop on CSR Grants to Strengthen Academia–Industry Partnership in Delhi–NCR." Approximately 100 faculty and students from colleges and universities from across Delhi–NCR attended the event, which also brought together representatives from the Office of the PSA, corporate social responsibility (CSR) foundations, non-governmental organisations (NGOs), start-ups, and research and academic institutions.

Dr. Gitanjali Yadav from the National Institute of Plant Genome Research, who is on the advisory board of DEEP-C and was convener at the event, opened the event and shared the main objective of the workshop: generating knowledge and awareness about building a culture of academia–industry partnerships, seeking CSR funding, and promoting integration between colleges and funding agencies.

Shipra Misra, Managing Director and CEO of DRIIV, then spoke about the ongoing efforts at DRIIV across six thematic areas, with emphasis on solid waste management, waste to wealth programs, alternate energy, and water security (the Amrut programme). She highlighted sustainability as the driving principle for all DRIIV initiatives and gave a few examples of industry engagement with students and educational institutions which were facilitated by DRIIV. She commented, *"We can no longer rely on the 'jugaad system' and as a nation must focus on leveraging breakthroughs of science and technology to reach the 5 trillion-dollar economy target by 2024."*

Prof. Jyoti Sharma, Director of the Institute of Lifelong Learning and member of DEEP-C's advisory board, followed to set the stage by wording DEEP-C's vision as, *"Creating an active, integrative, channelizing, and stimulating educator community that shares expertise, collaborates, and is willing to participate at multiple levels towards community building through the instrument of education."* In a persuasive tone, Prof. Sharma mentioned the role of educators in realising the focus of the National Education Policy (NEP) 2020 by training the students for problem solving, critical thinking, and entrepreneurial skills to enable them to handle the socio-economic problems of the society. She highlighted the role of DEEP-C in facilitating and enabling teachers to upskill and hone their expertise in education innovation, by exploring CSR funding and student engagement in research projects that address societal challenges or needs.

Prof. Hemalatha Reddy, Former Principal of Sri Venkateswara College, Delhi University, mentioned the concept of 'academic social responsibility' and commented, *"Unless we come forward as teachers nobody will solve our problems and cater to our needs as educators."* She stated that undergraduate institutions train the future human resource for the industry, yet there are huge skill gaps that remain, and industry ends up re-training the students. Speaking from her experiences with student-centric academia–industry engagements in Hyderabad and the e-YUVA scheme by the Biotechnology Industry Research Assistance Council (BIRAC), she informed the audience about the importance of skilling students to the needs of the industry and suggested CSR funding as one way of approaching this goal.

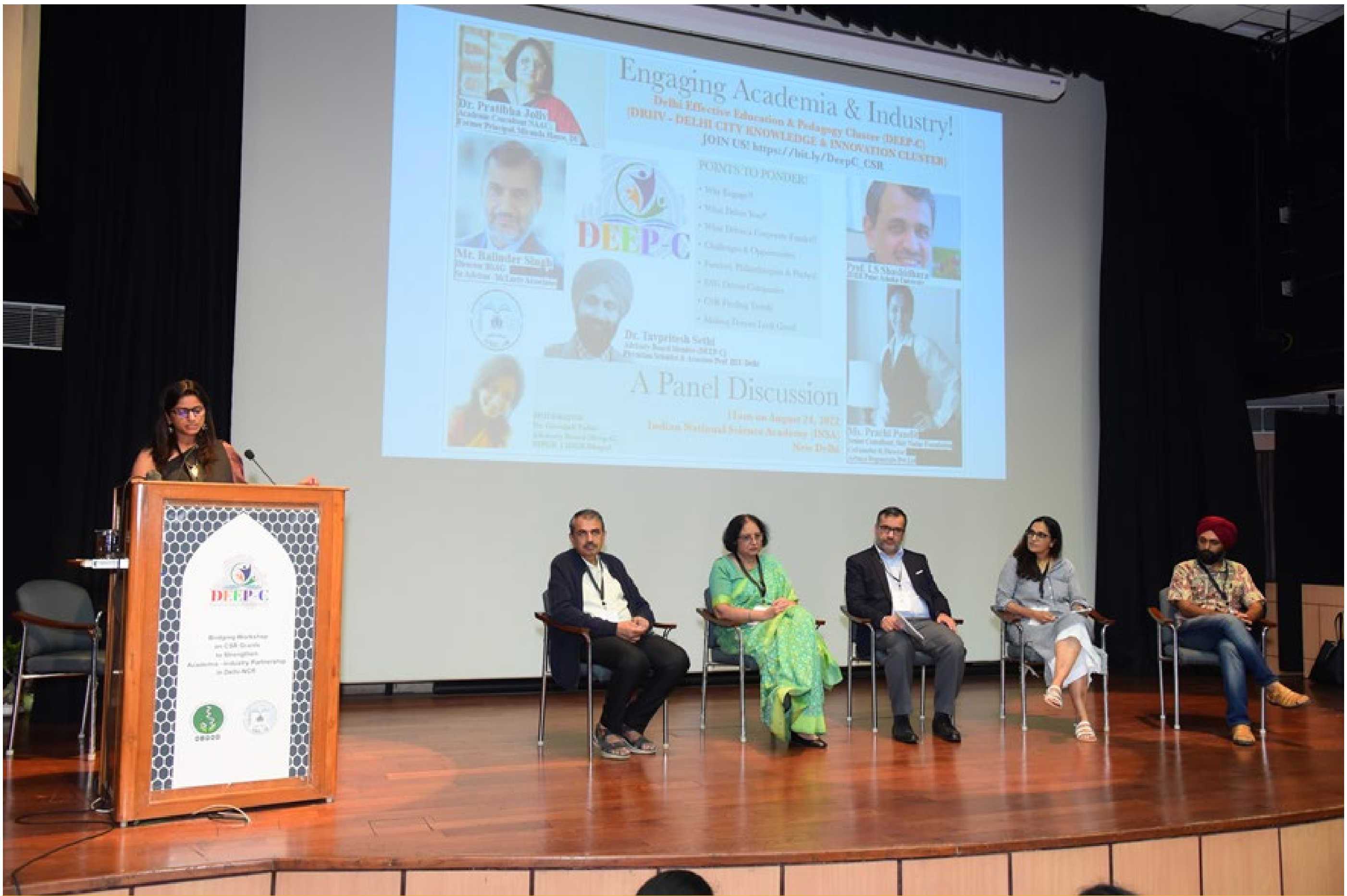
The keynote speaker, Dr. Arabinda Mitra, Honorary Distinguished Fellow at the Office of the PSA, spoke on government interventions to strengthen the academia–industry connect. He mentioned four policy changes with respect to CSR funding. First, CSR money will be opened up for innovation research at R&D institutions rather than being confined to supporting incubators. Second, CSR money will be used to support any activity under the United Nations Sustainable Development Goals (UN SDGs). Third, all central ministries are mandated to have a budget line that supports converting research into products. Lastly, all public sector undertakings (PSU) must invest 2% of their profits before tax into R&D. He commented, *"We believe these measures will unleash around 10,000 crores in R&D funding for the country."*

He added, *"S&T cannot be business as usual; with the new challenges of pandemics, climate change, and supply chain break, it is critical that scientists and technologists work by keeping in mind society as the centrepiece."*

Dr. Mitra further commented on the need to sensitize industries towards working with academic institutions and shared that soon industry-led S&T clusters will be on the ground to promote active partnerships with academia and the government. Finally, he concluded with mention of how the government is envisaging the promotion of R&D in tier 1 and 2 institutions to increase the critical mass of scientists and technologists in the country and is planning to prioritise funding for social sciences research.

While the morning session focussed on informing the audience on the efforts of DRIIV, DEEP-C, and the Office of the PSA towards bridging academia–industry gaps, the forenoon session delved more deeply into the theme via a panel discussion with doyens from both the worlds.

Prof. L. S. Shashidhara, who is a Professor at Ashoka University and Program Coordinator at DEEP-C, highlighted that industry is the channel through which solutions for real life problems are found, and industry is how these solutions reach the masses on a large scale. He stressed on the aim of higher education to create students capable of solving real life problems and emphasised the need for academia–industry engagement in this



Panel discussion on "Bridging the academia–industry gap." Panel experts from left to right: Prof. L. S. Shashidhara, Dr. Pratibha Jolly, Balinder Singh, Prachi Pandit, and Dr. Tavpritesh Sethi; with Dr. Gitanjali Yadav as moderator.
Image credits: DEEP-C

context. He remarked that *"90% of the jobs are in industry. If we fail to provide our students with real life scenarios, the true experiences of identifying an issue, and the process to working around it by application of knowledge and technology, we are doing an injustice to them."*

Dr. Pratibha Jolly, Academic Consultant at the National Assessment and Accreditation Council (NAAC) shared her own story of obtaining funding as an undergraduate faculty towards building education through 'doing-based models' of teaching. She concluded by saying, *"We create an ecosystem where we innovate and ideate, reach out, and more importantly, give, in the form of individual social responsibility towards building a community of practice for mainstreaming our efforts for improving education, research, and its impact."*

Balinder Singh, a public policy innovator, shared his experiences on building collaborations across corporations, NGOs, businesses, and media communications. He pointed out that opportunities for bridging the divide between industry–academia–government always existed but siloed thinking has been a huge impediment; however, the scenario is shifting hugely towards such partnerships. He shared the motivation and fine points behind the three types of CSR funding: philanthropy, family run foundations, and corporates.

Prachi Pandit, current CEO of Arbuza Healthcare and a former researcher and consultant at the Shiv Nadar Foundation, commented, *"If you are an academician trying to be productive in the CSR funding landscape, it is very important to unlearn many things."* She talked about four things that academicians need to approach differently in the CSR arena: communication in terms of quality and frequency, improved practices of resource allocation and utilization, transparency framework, and a reduction of administrative paperwork.

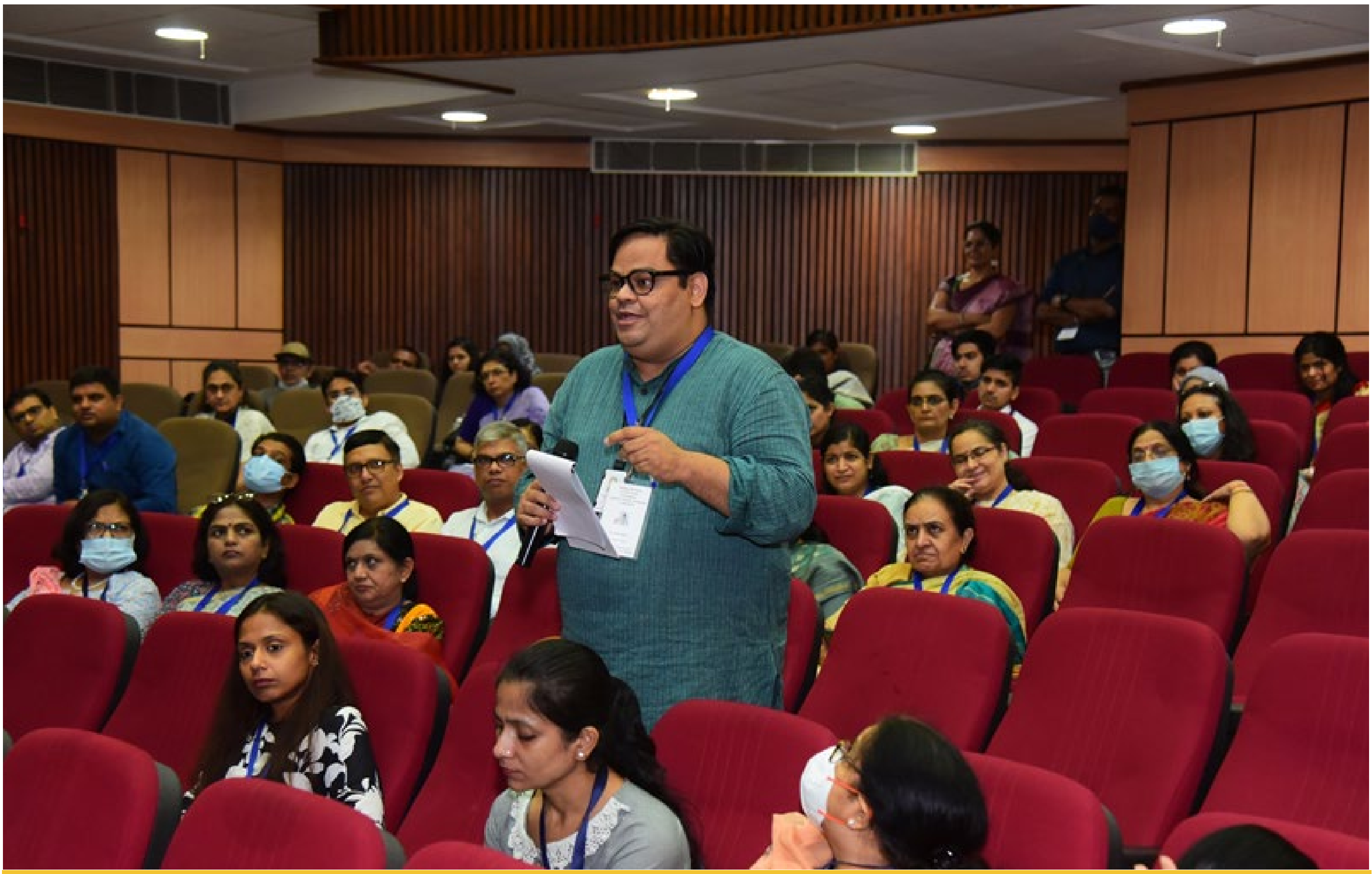
She concluded, *"Academicians need to create a framework on how to get CSR money, how to use it, and finally, report it back to the stakeholders."*

Dr. Tavpritesh Sethi, Group Leader at Indraprastha Institute of Information Technology, Delhi, shared his experiences of interfacing with the industry as a clinical healthcare researcher. He emphasized, *"Industry is looking for products that can be deployed at scale, a demand that is often not met by academicians."* He highlighted the importance of creating interfaces that can abstract away the complexities of academia to create value for a broader set of people.

The panel discussion ended with questions from the audience to the experts.

Two short talks by Rahul Kulshreshtha from the Strategic Alliances Division of the Office of the PSA and Leena Kukreja from the Indian Office of Science and Innovation at the Embassy of Sweden, provided information on several huge funding opportunities. While Rahul spoke about 'Manthan', India's exclusive platform for driving R&D coalitions between academia and industry, where one can apply for projects, share ideas, and seek funding; Leena described how the triple helix model of innovation helped Sweden gain its status of 'topmost country in innovation'. She also mentioned opportunities for mutual international co-operation at various levels of education and research.

Post lunch, I began the afternoon session with a tutorial on writing effective CSR grant proposals, which I conducted on behalf of Cactus Communications Pvt. Ltd., a research communication company where I work. I gave an overview of the history and present status of CSR, its legal framework, activities that fall under the purview of CSR, and the initiatives started by the government to promote CSR interventions for societal impact. I further discussed CSR donor mapping, alignment of project activities with CSR mandates, CSR policy documents, and fine points about writing grants. In addition, I presented case studies and explored examples of common gaps in grant proposals.



One of the participants posing a question to the expert panel during the panel discussion on "Bridging the academia-industry gap."
Image credits: DEEP-C

The last leg of the DEEP-C event covered case studies and success stories of environmental conservation and plastic waste management. Dr. Suresh Babu, Dean at the School of Ecology and Director at the Centre for Urban Ecology and Sustainability in Ambedkar University Delhi, shared his fascinating work on urban sustainability and conservation. He presented the case of the Dheerpur Wetland Restoration Project, citing student participation as a model of learning using a field-based learning approach. Dr. Harsh Mehrotra shared the details of 'Blue Nudge Fellowship Programme' to invite student participation from Delhi University colleges in waste segregation and behavioural change to promote sustainability and solid waste management. He also informed about the recent programme initiated by his foundation in Delhi–NCR schools via a Memorandum of Understanding with DEEP-C and DRIIV.

In the valedictory session, Prof. Shashidhara invited the participants to use DEEP-C as a platform for mutual consultation and actively contribute to the activities of DRIIV and DEEP-C as education collaborators. He spoke about colleges contributing to real research and collecting data on city problems via student engagement and working together with other institutions in the Delhi cluster. *"We are all connected, we can work on the same problems by bringing them to our colleges and implementing some key aspects of NEP 2020,"* he concluded.

Overall, the event generated energy, aspirations, and thoughtful reflection among the education community of the Delhi–NCR.

ABOUT THE AUTHOR

Dr. Adita Joshi is a science education and communication consultant, and a freelance science writer.

vigyaan dhaara

Adventures of Dadu, Mitti, and Samosa

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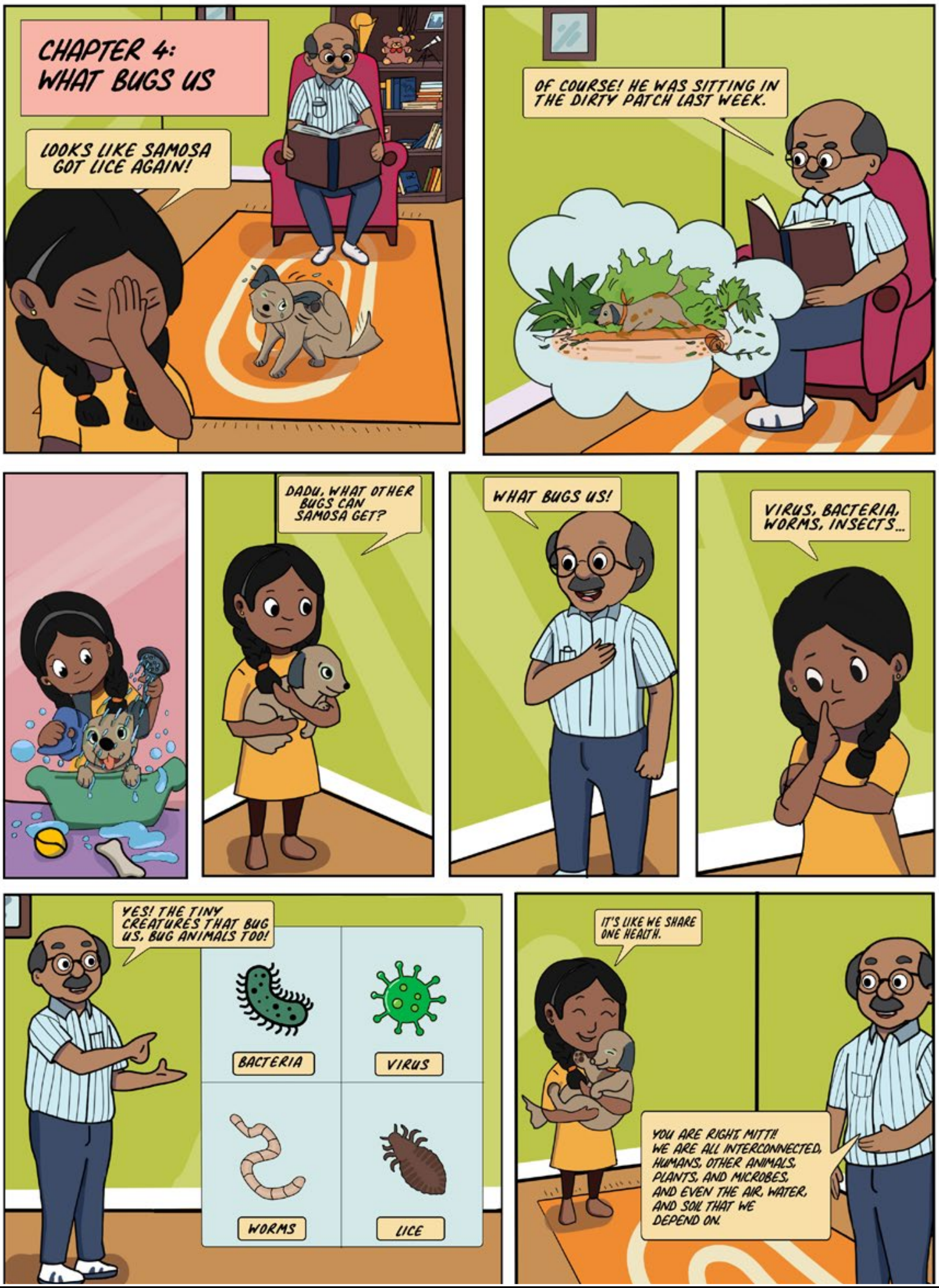

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ABOUT THE AUTHOR

Ipsa Jain is a scientist turned illustrator. She makes zines, books, stories, and images to share her love and joy for science.