TURNING POINT

Tata Centre
Technology and Design, IIT BOMBAY

INTERACTING WITH FACULTY AND THE TRUSTS

The aim of this interaction with Manoj Kumar, Tata Trusts, was to appraise IIT Bombay faculty members on the initiatives of the Trusts and the support that could be availed from them

Tata Centre for Technology and Design (TCTD), IIT Bombay, invited Mr Manoj Kumar, Senior Advisor, Tata Trusts, to have a dialogue with the faculty members associated with Tata Centre in April. The aim was to understand the challenges that the faculty members face in translating their research projects, and approaching TCTD with their problems.

As Manoj started his address, he spoke of products being pushed to the market instead of giving solutions. The faculty members could have services and not only products as solutions. But the question was to solve a critical problem that addressed accessibility to the base-of- the-pyramid segment, it was the solution that mattered and not whether it was a product or service.

He spoke of how the Tata Trusts, through venture philanthropy and impact investing, has been building an ecosystem for technology development and social enterprises. The Tata Centres at IIT Bombay, MIT, Chicago Booth, Cornell and other universities, and an incubator and accelerator for social enterprises known as Foundation for Innovation and Social Entrepreneurship (FISE) are part of this ecosystem.

When challenged by the faculty that students and the research teams were not really interested in taking up the solution as entrepreneurs, Manoj pointed out that there were enough people outside in the market ready to take on these solutions to the market. Interestingly, a lot of undergraduates seem to have approached FISE with ideas and intent to work.
With FISE looking at the business management side of the lab-to-market story, Manoj offered that virtual centres like TCTD could pump out technological solutions regularly. In turn, FISE could help create NGOs, entrepreneurial threads and the markets, to set up the investment ecosystem. The academic institutions could work to continue and supply their technologies and ideas to this system, on a regular basis. Here, running grand challenges could be a sound idea where well-articulated problem statements could be shared by the faculty members within the ecosystem. A change where the model could be more demand-driven and the need assessed and pre-validated, with IIT Bombay steppping in to revalidate it with its solutions, would also be encouraging. In all, it was a well-attended session with the IIT Bombay faculty participating in the discussion in an interactive manner.

- Gayathri Thakoor, Project Manager

IN THIS ISSUE

LEARNING @ PROSEMINAR

The MNG 630 course serves to inculcate in students the passion to innovate and address social challenges, and then apply the learnings to their respective projects

Tata Centre for Technology and Design (TCTD) @ IIT Bombay offers two seminar-based courses to help students understand the challenges of designing and implementing technology solutions for resource-constrained communities. The MNG 630 course taught by Prof. Arti Kalro, Shailesh J Mehta School of Management, in the spring semester, builds upon the learnings from MNG 629 course and aims to equip the students with requisite skills and methodologies, which they would actively apply to their respective TCTD projects.

The core learning objectives of the course include: i) training students to understand the challenges of resource-constrained communities and base-of-the-pyramid (BOP) segments, ii) understanding the frameworks used in social entrepreneurship like Go-to-Market Strategies, Diffusion of Innovation, New Product Development process, Systems Thinking Approach, Design thinking, B-plan, Business Model, with real case studies & industry interactions, and iii) learning qualitative and quantitative problem-solving approaches and research designs for need identification and need validation in a resource-constrained setting.

This year had an interesting mix of lectures delivered by academicians as well as industry experts. Prof Arti's first two sessions introduced the nature of innovations in business models for the BOP markets and also reflected on the go-to market strategies for such markets. With the help of two case studies from the healthcare domain - one on General Electric Healthcare, and another on Aravind Eye Care - the students were able to appreciate the concepts of reverse innovation and creating shared value, mapping the value curve for proposed soultions, acknowledging the pros and cons of various service delivery options that co-exist in the base-of-the-pyramid markets, and examining the crucial impact of role of communications in diffusion of innovations. Prof. Murali Sastry, CEO, Monash Academy, spoke on the topic of affordable water purifiers highlighting the applications of nanotechnology in making available affordable clean drinking water to the BOP markets.

In another session, Prof. Arti focussed on the case of Eli Lilly, a global pharmaceutical company that piloted an experimental unit for early-stage drug development, to elaborate on the importance of re-engineering the process of new product development, at an early stage - on eliminating bad debts and at a later stage - on maximizing value of products. Interestingly, through the discussion of this case, the significance of Type I error - investment risk and Type II error - opportunity risk also came to be appreciated by the students. The session on measurement and scaling techniques was designed to help the students get introduced to making systematic observations for the purpose of analysis. The in-class discussion was helpful in enabling the students to think through the nature of data they would collect and analyse as part of their respective TCTD projects.

A session by Prof. Santosh Noronha gave the students a basic introduction to statistics, while discussing the various challenges faced as part of the field trials conducted for their projects. As part of the mid-term evaluation for MNG 630 course, students gave presentations on their projects to the TCTD Executive Committee members. Building on the technique of Stakeholder Analysis learnt in MNG 629 course, students applied the same to their own projects and came up with their research design, elaborating on the research techniques used to collect relevant data.

The session on Conjoint Analysis was a perfect blend of theory and practice, with examples to help marketers decide which product attributes were important to the consumer. Ami Parekh from Khaitan Legal Associates garnered immense participation from students talking of different forms of business enterprises and their legalities, comparative analysis between forms of business entities, considerations for choosing one business form over another, and the benefits available to start-ups.

Prof. Arti Kalro, Assistant Professor, SJMSOM

Prof. Murali Sastry, CEO, Monash Academy

Prof. Santosh Noronha, Chemical Department, IITB

Ami Parekh, Khaitan Legal Associates

Huda Jaffer, SELCO

G. Sunderraman, Executive Vice President,Godrej Chotukool

Prof. Sarthak, SJMSOM

Richard Dias, General Manager, Hindustan Waste Treatment Pvt Ltd.

An engaging session with Huda Jaffer had her speak about the process mapping that is meticulously followed for all projects at SELCO. She offered rich insights not only around the importance of stakeholder analysis, but also emphasized on balancing desirability, feasibility and viability when innovating to provide solutions.

The protagonist of Godrej Chotukool, G. Sunderraman, Executive Vice President, Corporate Development, Godrej & Boyce eloquently shared his experience on how his team successfully combined the social gap – the need for an affordable refrigerator, and the business gap - need for disruptive innovation in refrigerator industry, in designing Godrej Chotukool. Towards the end of the course, a session on Basic Economics and the fundamentals of writing a Business Plan by Prof. Sarthak from SJMSOM, gave the much needed exposure on the importance of understanding business finances.

The concluding session was on waste management by Richard Dias, General Manager, Hindustan Waste Treatment Pvt Ltd., where the students learnt about the integrated municipal solid waste management facility successfully installed in Goa, compliant with the solid waste management rules of Government of India. The session compelled the audience to reflect upon the importance of 3Rs i.e. Reduce, Reuse and Recycle and also emphasized on the key role of waste segregation at source.

MNG 630 course has significantly evolved over the last three years with critical reflection from students, and now provides an ideal platform for engineers and management students to work together and improve the quality of life of the resource-constrained communities.

- Dr. Disha Bhanot, Postdoctoral Fellow

TALKING OF FAILURES AND IMPACT

A team from Tata Centre @ IIT Bombay attended a recent conference hosted by SELCO in Bengaluru.

The Impact Failure Conclave 2018 hosted by SELCO at Indian Institute of Management, Bangalore, showcased an interesting mix of speakers and attendees, in April. Prof Santosh Noronha, an Executive Committee member at Tata Centre, IIT Bombay, was one of the panellists at this two-day event.

The aim of the conference was to provide a platform for an in-depth and open discussion about the role of failure in the development space. While the speakers attempted to celebrate learnings that emerged from failures, they also spoke of the impact that could be created through the learnings. The conference tried to highlight failed ideas and projects by analysing the point of failures, and create new lessons to be adapted to other scenarios for higher success rates.

There were quite a few panel discussions capturing failures in philanthropy, investment, entrepreneurship and identifying the need.

Prof Noronha was a part of the discussion on Education – Scaling sustainably: Failures in ensuring numbers through scale while ensuring the `quality' of those numbers. He spoke of challenges in research and education in the higher level of the education spectrum. The systemic failure of having more than sufficient lab facilities in the IITs which were grossly underused in comparison to the minimal equipment seen in other engineering college labs in tier 2 and tier 3 cities, was a valid point. He summarised that the system had failed with its lack of ability to create an intermediate layer of colleges for students who still aspired to get higher education.

With a lot of thought and effort put into this event, the hope is that such open discussion of failures will result in building efficient and higher impact solutions soon.

- Gayathri Thakoor, Project Manager

APPROVED NEW PROJECT PROPOSALS

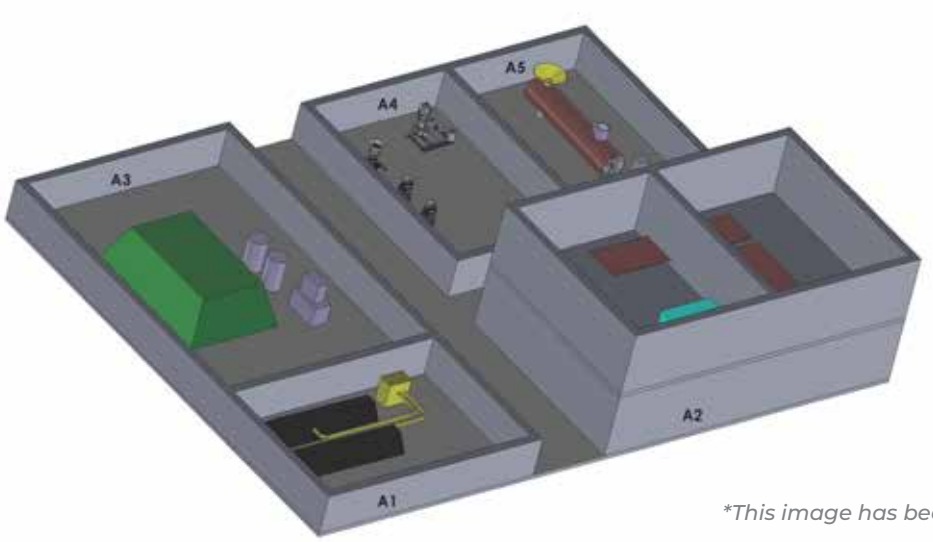
Here is the list of newly approved projects in April 2018, at Tata Centre, IIT Bombay.

No.	Project Title	PI and Co PI	Depts.	Domain
1	Design, development, and testing of aerogel-based steam generation system and solar cooker SEED	Prof. Anish Modi Prof. Shireesh B. Kedare Prof. Evelyn Wang	Department of Energy Science and Engineering, Device Research Laboratory MIT	Energy
2	Bodhi Tree: Computer science programming and laboratory instruction and assessment TRANSLATION	Prof. Kameshwari Chebrolu Prof. Varsha Apte Prof. Bhaskaran Raman	Department of Computer Science & Engineering	Education
3	Accessible and affordable digital learning aids for children in rural communities SEED	Prof. Jayesh Pillai	IDC School of Design	Education
4	Electrospray based indoor air cleaner development SEED	Prof. Rochish M Thaokar Prof. Y S Mayya Prof. Chandra Venkataraman	Department of Chemical Engineering	Waste Management
5	Design and development of box-cooker equivalent solar PV powered electric cooker for indoor applications SEED	Prof. Chetan Singh Solanki, Prof Jayendran Venkateswaran	Department of Energy Science and Engineering, Indian Engineering and Operations Research	Energy
6	Development of a sensitive blood-based biochemical assay for diagnosis of Parkinson's disease at the pre-motor stage SEED	Prof. Samir Maji	Department of Biosciences and Bioengineering	Healthcare
7	Seed Grant for wearable arm band for non-invasive blood glucose monitoring using EM waves SEED	Prof. Jayanta Mukherjee	Department of Electrical Engineering	Healthcare
8	Affordable tinnitus detection device and affordable tinnitus treatment - E medicine SEED	Prof. Maryam Shojaei Baghini	Department of Electrical Engineering	Healthcare
9	Automated aid for screening of oral cavity lesions – a feasibility study SEED	Prof. Amit Sethi	Department of Electrical Engineering	Healthcare
10	Adjustable Thermoelectric Power Generator Belt for Rural Communities SEED	Prof. Sudarshan Kumar Prof. Asim Tewari	Department of Aerospace Engineering	Energy
11	Mini storage system for vaccines in rural India using renewable energy resource SEED	Prof. Asim Tewari, Prof. P. Kumaresan	Department of Aerospace Engineering	Energy
12	Moist membrane based technology for biogas upgradation TRANSLATION	Prof. Jayesh Bellare & Prof. A K Suresh	Department of Chemical Engineering	Energy

	WHITE PAPER PROJECTS			
1	Facilitating diffusion and adoption of TCTD's innovation projects: applying diffusion and design theories **WHITE PAPER**	Prof. Subodh Wagle Prof. Shireesh Kedare Prof. Pramod Khambete (Adjunct)	CTARA, Department of Energy Science and Engineering, IDC School of Design	All domains
2	Study on local solar entrepreneurship in India: mixed method approach **WHITE PAPER**	Prof. Jayendran Venkateswaran, Prof. Chetan Solanki	Indian Engineering and Operations Research, Department of Energy Science and Engineering	Energy
3	Enhancing development impact by facilitation of participatory exercises at TCTD **WHITE PAPER**	Prof. Subodh Wagle, Prof. Shireesh Kedare, Prof. Pramod Khambete (Adjunct)	CTARA, Department of Energy Science and Engineering, IDC School of Design	Energy
4	Evolving and articulating technology-based innovations for enhancing access to water and sanitation of BoBoP (Bottom of the Base of Pyramid) sections of society in the mumbai city **WHITE PAPER**	Prof. Subodh Wagle Prof. Pradip Kalbar Prof. Pramod Khambete (Adjunct)	CTARA, Department of Energy Science and Engineering, IDC School of Design	Water

PLANS FOR WASTE MANAGEMENT FACILITY APPROVED

The integrated waste management facility model at IIT Bombay campus could be rolled out to other communities, when successful



A1	WINDROW COMPOSTING
A2	UTILITY AREA AND LAB
A3	BIOREACTOR LANDFILL
A4	GARDEN WASTE PELLETIZATION
A5	PLASTIC PYROLYSIS

Preliminary plan of integrated waste management facility at IIT Bombay

**This image has been used for representational purposes only*

The need for bringing in efficient and scientific ways of managing waste has spearheaded a group of faculty members and students, associated with Tata Centre for Technology and Design (TCTD), to address various challenges in municipal solid waste. The projects that this group is working on will use an approved site on IIT Bombay campus, as a test bed.

This facility will demonstrate technologies developed at TCTD such as household andcommunity composting system for kitchen waste; pyrolysis for conversion of plastic into fuel oil; pelletisation of garden waste and use of pellets in a gasifier based cook-stove; bioreactor landfill.

Housed in the integrated waste management facility, these projects will also take care of campus waste to a large extent. The two-three tonnes of campus waste will include garden waste, refused dry waste, wet waste and plastic. Kitchen waste from the hostels on campus will be taken care of by the biogas plant in a separate space.

With the space approvals from the Institute in place, the preliminary architectural plans for the construction of the sheds in the facility are ready. The facility is expected to be functional by the end of 2018.

- Gayathri Thakoor, Project Manager

Patents

TCTD, IITB has had a fair share of projects that have applied for patent disclosure. The following is the list of 13 TCTD, IITB projects that have gone through the invention disclosure process for patent applications since 2014:

Project	Faculty	Domain
Low power transceiver for wireless communication	Prof. Jayanta Mukherjee, Department of Electrical Engineering	Energy
Patent applied for Low power, off-chip inductor-less MICS band receiver		

Project	Faculty	Domain
Development of Advanced Dark Colour Cool Roof Coatings	Prof. Anand S Khanna, Department of Metallurgical Engineering & Materials Science	Energy
Patent applied for A water based system for concrete substrates		

Project	Faculty	Domain
Development of Advanced Dark Colour Cool Roof Coatings	Prof. Anand S Khanna, Department of Metallurgical Engineering & Materials Science	Energy
Patent applied for A solvent-based system for metal roofing substrates		

Project	Faculty	Domain
Through the earth communication for underground min	Prof. Ashutosh Patri & Prof Jayanta Mukherjee, Department of Electrical Engineering	Energy
Patent applied for Hybrid Communication System for Underground Mines		

Project	Faculty	Domain
Hemosorb-Haemostatic dressing for trauma care	Prof. Rohit Srivastava, Department of Biosciences and Bioengineering	Healthcare
Patent applied for Hemosorb –haeomstatic dressing		

Project	Faculty	Domain
Cervical Cancer Screening	Prof. Santosh Noronha, Department of Chemical Engineering	Healthcare
Patent applied for Menstrual cup inserter		

Project	Faculty	Domain
Process design for the reclamation of waste sand from small foundries	Prof. Gajananrao N Jadhav, Department of Earth Sciences & Prof. Sanjay Mahajani, Department of Chemical Engineering	Waste Management
Patent applied for Multi stage attrition device for reclamation of waste foundry sand		

Project	Faculty	Inventors	Domain
Process design for the reclamation of waste sand from small foundries	Prof. Gajananrao N Jadhav, Department of Earth Sciences & Prof. Sanjay Mahajani, Department of Chemical Engineering	Moiz Mohammad Khan, Manvendra Singh	Waste Management
Patent applied for A method and device for reclaiming green waste foundry sand			

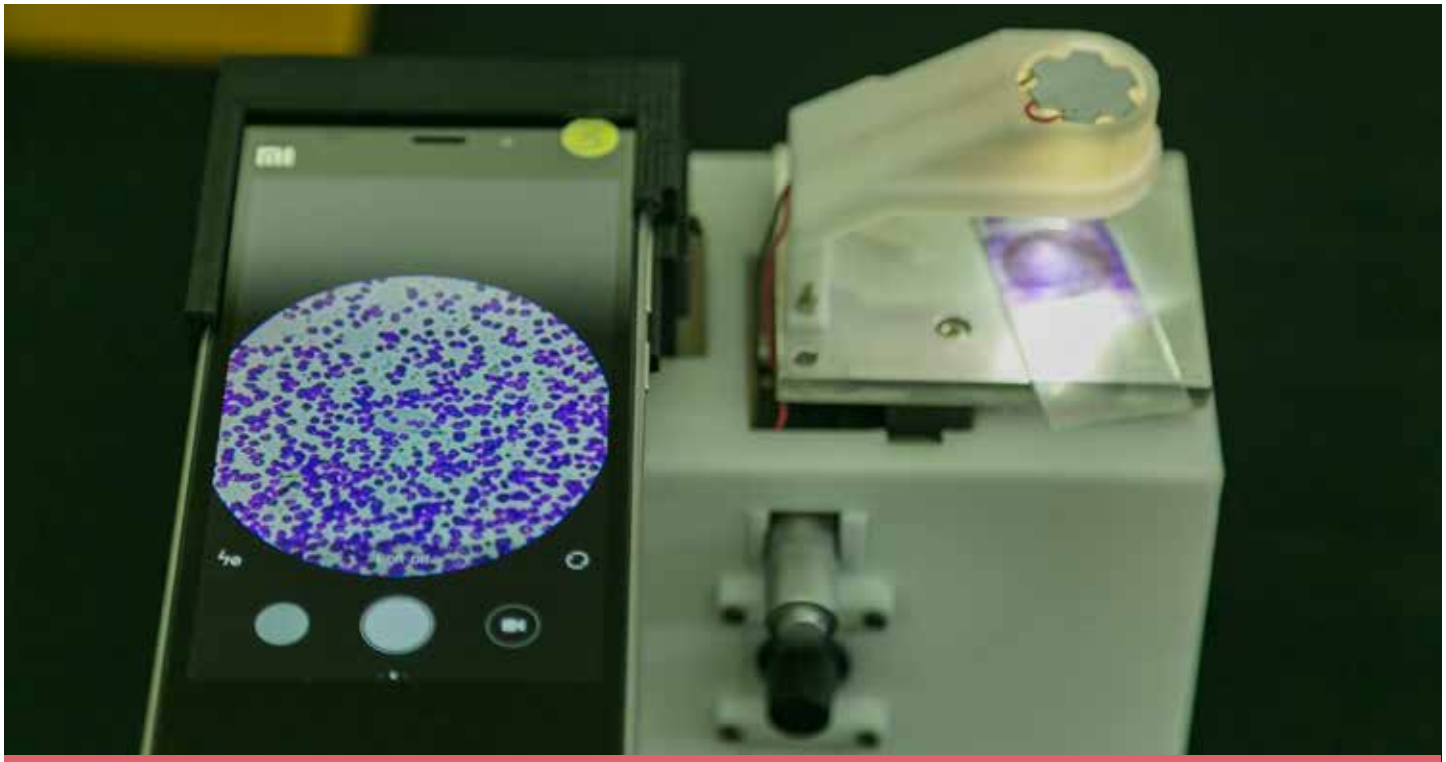
Project	Faculty	Inventors	Domain
Humidification-Dehumidification Desalination System	Prof. Shankar Krishnan, Department of Mechanical Engineering	Pankaj Avhad	Water
Patent applied for Low Temperature Desalination System			

Project	Faculty	Domain
A mobile phone microscope with applications in point-of-care diagnostics and health education	Prof. Debjani Paul, Department of Biosciences & Bioengineering	Healthcare
Patent applied for A Mobile Phone Microscope		

Project	Faculty	Domain
Developing CAR-T cell technology platform for cancer immunotherapy	Prof. Rahul Purwar, Department of Biosciences & Bioengineering	Healthcare
Patent applied for Methods and compositions for treatment of CD19+ cancers using anti CD19 CAR constructs		

Project	Faculty	Inventors	Domain
Gasifier Based Cook-Stoves to Manage Garden Waste	Prof. Sanjay Mahajani, Department of Chemical Engineering	Dr. Sonal Thengane, Prabodh Gadkari	Waste Management
Patent applied for Downdraft Gasification Assembly for High Ash Biomass Feedstock			

Project	Faculty	Inventors	Domain
Enabling livelihood generation in tribal & marginal farmers through a commercialization project on utilization of agro residues to grow edible mushrooms	Prof. Sanjay Mahajani, Department of Chemical Engineering	Chandrakala Sharma	Food & Agriculture
Patent applied for Development of an efficient protocol for Oyster Mushroom Cultivation in rural areas			



POINT-OF-CARE DEVICE TO DIAGNOSE SICKLE CELL DISEASE

This healthcare project aims to give a confirmed diagnosis of the sickle cell disease at point of care

Sickle cell disease is an inherited blood condition that results in restricted blood and oxygen flow to various body parts, leading to a multitude of complications. Conventional diagnosis relies on sending the blood samples to the laboratory for testing, which is a tedious, time-consuming and expensive process. Realizing the need to take the laboratory to the patients, Prof. Debjani Paul, Dept of Biosciences & Bioengineering, in collaboration with Medprime Technologies, a start-up at IIT Bombay, has come up with a mobile phone based microscope that can be deployed as a point-of-care device for diagnostics.

Functioning as a miniaturized version of the conventional inverted microscope, it utilizes the microfluidic-imaging chip, image processing and an indigenously developed assay to give a confirmed diagnosis of the sickle cell disease at point of care. The additional advantages include minimal expertise required in operating the microscope, increased portability and the ability to record and process images. Incorporating feedback from the users, the device has gone through many design iterations to get to the current prototype that is highly user-centric.

In partnership with Valsad Rakt Kendra, Gujarat, the project team has already tested the device and assay on more than a hundred samples, both in the lab as well as in field, and obtained promising results. They are now looking to collaborate with government screening programs within the next year to have large-scale, multi-site field trials in parallel with tying up with a private diagnostic company to compare the device's performance with the existing gold standards.

Having made significant progress in the device, the team is preparing itself for the upcoming challenges, including regulatory aspects and commercializing the product. At present, the group is not looking at incubating the product on its own and is looking out for industrial partners who might be interested in licensing the technology.

- Jasleen Chhabra, Tata Fellow 2016

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