



SEPTEMBER 2015

TURNING POINT

Issue No. 4



TEAM NAME: SRIJAN

MEMBER NAMES: MANUSHI KAUSHIK, KUNAL KATARIA, VIKRAM VARMA

PROJECT: Designed a low-cost integrated height, weight and BMI monitor for monitoring malnutrition in rural children



TEAM NAME: COGNOCERE

MEMBER NAMES: ARO SATISH, GOWDHAN PRABHAKAR, DHAYALAKUMAR

PROJECT: Developed a simple, yet elegant movable shelf-rack. The 'Dyna Rack' can be lifted and brought back down to ground level by a simple steering wheel mechanism attached to the shelf's exterior.

Field visit as part of TCTD proseminar

Tata Centre at IIT Bombay, as part of its course on Technology and Design for End-to-End Innovation I and II (commonly referred to as proseminars) prepares the Tata fellows to engage in projects that introduce and sensitize them to the challenges of resource - constrained communities of our country. Both these courses are designed around examining how technology, design and management specifically influence End-to-End innovation (from conceptualization to market).

This semester, Tata Centre has incorporated field work component as a compulsory part of the proseminar course. Students have been divided into eight groups (consisting of four students) and each group would be working on one of the Tata Centre's thematic areas of -Health care, Energy, Waste Management, Food and Agriculture, Water and Education. The groups will work in close collaboration and guidance of their mentors in their respective thematic area.

The aim of the field visits is to get the students to engage first-hand with the issues in each of the thematic areas (as identified above) and to encourage them to get a holistic understanding of the issues/needs of the community under study.

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Prior to the field visits, mentors would share with their respective groups the relevant area specific and demographic information. Learnings from existing studies can be used to better plan the interventions and address problems that need redressal. On field, the need assessment study will enable students to identify needs and later prioritise needs for better focus. After the needs are prioritized, the groups need to brainstorm the needs and attempt to objectively rank them as per their importance. Thus from a broad set of needs, only four core needs which are specific to the eight thematic areas will be chalked out. Based on this, the second field visit would materialize when the students will do a detailed field study and translate the needs into future action points.

The students would be required to make presentations on their learnings from their field visits and would also submit a detailed report on the same.



'IMAGINE, INNOVATE, CREATE'

TCTD organised the first edition of 'Kalpana' in June - July 2015. Targeted at youngsters aged 18-32 years, the national level innovation and fabrication competition was part of the Centre's endeavour to enhance engagement with the community at large. Through the event, the Centre aimed at identifying and training talented youth in useful fabrication and prototyping skills. Simultaneously, the competition generated a pool of workable ideas that could be pursued by the Centre.



The Kalpana competition comprised three phases, each testing various skills required in the innovation process. In the first stage, the Centre proposed three problem statements in the thematic areas of energy, healthcare and housing. Participants were invited to ideate and submit solutions for the same in teams of 2-4. This activity identified participants with the sensitivity to identify pertinent social problems, who were then invited to identify a social problem, evaluate its severity, and come up with an engineering solution. The best entries from the second phase eventually fabricated their proposed solutions at our state-of-the-art Product Realization laboratory. In the final phase, students went through the complete process from deciding the material of construction,

planning the fabrication schedule, and finally building and demonstrating the working prototype. Some of the products developed include 'Dhvani', an assistive device for speech-impaired persons. 'Somaiya 1' was a device to generate wind power from moving vehicles, while a third team developed eye-blink controlled wheelchairs for the elderly.

Kalpana received quite the phenomenal response, with 1100 entries in the first phase itself. 105 teams progressed to the second round, where judges had an exceedingly tough time shortlisting the 10 entries for the final fabrication round. The final round participants demonstrated considerable energy and enthusiasm, and the lab was open night and day as they worked to give their ideas shape. The participants obtained exposure to the gamut of innovation activities from ideation to prototyping, while also picking up skills in mechanical and electronic fabrication on sophisticated equipment. The final prototypes were truly innovative, with potential for commercialisation to solve pressing societal problems. The inaugural edition of Kalpana was a great success and has set the bar high for future editions.





JAUNDICE DIAGNOSTICS

Interview with
Prof. Soumyo Mukharjee
(Biosciences and Bioengineering, IIT Bombay)

TP : What has been your motivation to research in the domain of neonatal care Jaundice diagnostics?

SM : In India, we have 80% of our population largely underserved by healthcare. One of the many problems that manifests in the domain of healthcare is that, around 25% of people hovering around the BPL (Below Poverty line) fall under the line each year, due to ancillary healthcare expenses (due to loss of income for absence from work, due to illness of the patient and relatives, cost of staying near a hospital in a district headquarter or metropolitan city, etc). Thus, affordable point-of-care diagnostics solutions are essential for the poor. The problem of neo-natal jaundice is also very prevalent in India. Even my younger daughter was born with low birth weight and jaundice. It pains me to see little kids with low birth weight pierced thrice or more per day for blood tests. The stakeholders extend from Neo-natal intensive care units (NICU's) to villages where births are generally administered by mid-wives, to quickly assess if the new born baby has severe jaundice.

TP : What is the novelty of this approach towards Jaundice diagnostics?

SM : This project attempts to quantify and codify the experience of doctors. Jaundice can be assessed by the level of yellowish colouring on the skin and the basis of location of the yellowing. The technology behind this is simply a spectrometry or a colorimetry procedure where we use lights of different colours to illuminate the skin. Since yellow absorbs light of different wavelength variedly, the absorbance data can then be correlated to the amount of yellowing of in the skin. The novelty is also in the image acquisition which is done on a mobile phone platform. In-vitro tests have showed very good correlations standard values. Although the child has to be given one prick to collect blood in order to calibrate the machine once a day, it can give an approximate estimate of bilirubin count without using a needle for the rest of the day. The calibration also takes care

of the variety of skin tones Indian babies. This can also be coupled with phototherapy. The device also takes care of blanching (stretching out the skin for better visibility) using a sterilizable contraption in the front-end. Operating this device requires zero training because intuitive and ubiquitous mobile phone interface. This device also has zero consumable cost as well.

TP : What are the challenges in this project?

SM : The challenge is not to resort to cost-intensive processes but find alternative algorithms to analyse the colours. Another challenge is the choice of perfect material and shape for the blanching contraption. The optimisation of the camera angle and aperture are all minor but unique challenges in itself. Doctors in India and even internationally have shown interest in this and have requested for prototypes to test in their hospitals. However, in the future when village deployment would be planned, we might face social acceptance challenges.

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TP : What according to you would be the impact of the project?

SM : I fondly hope that one day this device will be in the hands of every mid-wife in India. Presently, a mind-boggling 60% neo-natals are born with slight jaundice, and about 10% of them require treatment. We can also foresee that this device will better the statistics because it can help accelerate diagnostics which would in turn lead to quicker medication of the patients.

TP : What would be your advice to the budding researchers?

SM : Dig deep into your life, observe where you or your family members have faced problems, there lies your biggest motivation. To work towards lessening the pains of your near and dear ones give you the deepest satisfaction. In my case, a cardiac problem of my mom led my colleagues and me to research a problem whose solution has incubated a company at IIT Bombay. Thus keeping an open mind, constant engagement with challenges, and looking around near and far is the key to success.

- As told to **Aayush Gupta**
(Tata Fellow, BSBE)



Orientation of IITB-MIT Tata Fellows

From August 7-10, 2015 the MIT and IITB Tata Centres held a joint orientation for new Tata fellows at IIT Bombay. The joint orientation was planned to facilitate a warm get-together of the Tata fellows from the sister centers and was designed around interactive discussions and coordinated field visits.

The programme began with the ice breaking session between the Tata fellows of IIT Bombay and MIT USA on August 7th, 2015. This was followed by a welcome dinner at Gulmohar, IIT Bombay which facilitated an informal exchange of projects and research ideas.

Day Two, began with an introduction about the respective centres by Prof. Sanjay Mahajani (Professor Incharge, Tata Centre for Technology and Design, IIT Bombay) and Dr. Robert (Director, Tata Centre for Technology and Design, MIT, USA). They discussed with the students the key focus areas of research and the motivation for establishment of the respective Centres. This was followed by a pro-seminar on Poverty, Development Template for observations by Dr. Chintan Vaishnav. This gave the fellows enough fodder to ponder about their field visits.

Subsequently, the Tata Fellows undertook the inimitable Dharavi tour where they roamed around the smoky commercial hotspots and congested residential areas of Dharavi. From visiting the Dharavi slum, students observed that the residents are not "homeless/jobless" and that "slums can be places of economic activity, slum dwellers are important economic resources and should not be ignored in government schemes." One succinctly described it as "extreme capitalism." Beyond observing unsafe labor conditions, poor sanitation and crowding, fellows noted that "the problems' complexity needs to be dealt with care" and that "all potential solutions are interconnected" while striking a hopeful note that

Dharavi represents "an area in which we have immense scope to positively impact people's lives."

On day three, Mr. Sanjeev Phansalkar, the Program leader of Sir Dorabji Tata Trust and Allied Trusts presented the mission of Tata Trusts especially in the field of education and innovation. He explained the inception of the Tata Trusts and also responded to a number of queries about the projects they handle across India.

The thrill time of the orientation was during the virtual village game of Naranpur Express in which the Fellows formed teams of three/four role playing a village family and had to play with their socio-economic transactions. From the IIT Bombay, the Naranpur Express transported bi-institutional student team "families" to a rural village.

On the last day of the joint orientation (August 10, 2015) the Tata fellows were introduced to some of the successful entrepreneurial case studies like Nanosniff by Dr. Nitin S. Kale and Embryo by Mr. Nishant Kumar. While Nanosniff is working on new kinds of MEMS/NEMS technologies, Embryo is focusing on building innovative healthcare assistive devices. After these sessions, the MIT Tata Fellows travelled to Mahabaleshwar in Satara district of Maharashtra to have a first-hand experience of the contrasting environments of the lush green Medha cluster and the dry Phaltan block. This village visit led to discussions regarding the importance of water, political/societal influences on resources, urban migration and the sustainability of villages. The visit to Appropriate Rural Technology Institute saw specific solutions and the need to reflect upon the importance of design and sustainability.

On the whole, the joint orientation session provided the opportunity to build a cohort and start thoughtful discussions, as a precursor to developing technology-based solutions.

