

### Message from the Chairman



Dear IEEE Members,

I am happy to write to you in this penultimate issue of IEEE ICNL for 2018. At the very outset, I would like to state that my experience during 2017-2018 as IC Chair has indicated that if IEEE India fraternity works in unison, many positive things can happen in the years to come.

IEEE India Council is delighted to state that the "All India Student/ YP/ WIE Congress (AISYWC-18)", a flagship event of IEEE IC, was hosted by IEEE Bangalore Section with great pomp and show during 28th to 30th September 2018. This year, the congress was held at City of Palaces, Mysuru, and the local host was Vidya Vikas Institute of Engineering & Technology (VVIET). IEEE India Council is happy to inform that seven IEEE Sections of India extended their support to AISYWC-18. Around 450 participants took part in the Congress.

Maintaining the continuity during 2017-2018, IEEE IC F2F meeting was held on 30th September 2018 hosted by IEEE Bangalore Section on the sidelines of AISYWC-18 in Mysuru. It was a very good meeting with participation from many sections, which is bringing in greater cohesion in IEEE activities in India. I put on record our utmost appreciation of the efforts of IEEE Bangalore Section in relation to this F2F meeting.

This quarter was an eventful time for IEEE India Council. IEEE Bombay Section in collaboration with IEEE India Council organized a day-and-a-half long 'Tutorial cum workshop on AI&ML' during August 10-11, 2018. The local host and the venue for this edition was the National Institute of Industrial Engineering (NITIE), Mumbai. The event was supported by IEEE Technology and Engineering Management Society (TEMS) and Standards Association (SA).

IEEE India Council in association with IEEE Bangalore Section and IEEE TEMS Bangalore Chapter organized a two-day "IEEE Workshop on Intrapreneurship" on July 28 & 29, 2018, at Hotel Sterlings Mac, Bangalore. This workshop was organized especially for Industry Professionals working in large/medium industries, PSUs and R&D Organizations.

IEEE Foundation Events on 'Furthering Indian Perception of IEEE' were organized by IEEE Bombay Section, IEEE Foundation and IEEE India Council on three consecutive days entitled "Destination Moon: Building of a Moonshot" at TIFR Mumbai on 14th September 2018, at Don Bosco Institute of Technology, Kurla (W), Mumbai, on 15th September 2018 and also at D. G. Ruparel College of Arts, Science and Commerce, Mumbai. More than 350 participants took part in the programs.

It is noteworthy to mention here that the poster on WIE Symposium submitted by Dr Rajashree Jain was selected as one of the Top 10 listed posters for the WIE "Best Event" Poster Competition in the R10 SYWL Congress held in Bali, Indonesia, in August 2018.

I congratulate all the IEEE leaders and volunteers, who have made all these wonderful activities to be great successes. I look forward to an equally active last quarter of 2018, which happens to be the last quarter of my tenure as IEEE IC Chair.

With best fraternal greetings,

Sivaji Chakravorti  
IEEE IC Chair 2017-2018  
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## Message from Editor

H.R. Mohan, [hrmohan.ieee@gmail.com](mailto:hrmohan.ieee@gmail.com)

Dear readers,

We are happy to present the third quarterly issue of India Council Newsletter (ICNL) for the year 2018. This current issue of ICNL in 90 pages has 13 articles (maintaining at the same level of last issue), along with few events reported by some sections and society chapters. We thank the chairs of the sections and the conveners of the events for sending the reports as per guidelines and IC Chair Dr. Sivaji Chakravorti and IC Secretary Dr. Preeti for their coordination. However, it is noted that not all major and special events including the India Council events are reported for publishing in the newsletter in spite of repeated requests. We look forward to a better response to our request for activity reports. Please send them directly to the newsletter email id at [ieee.icnl@gmail.com](mailto:ieee.icnl@gmail.com) as per the guidelines published in the newsletter and also available at <https://goo.gl/DcVPmx>

ICNL thanks the authors who have positively responded to our request and contributed the following informative and interesting articles included in this issue.

- Embracing the Next Billion Users of the Internet by Ms. Pitinan Kooarmornpatana
- INO: A National Mega Science and Engineering Project by Dr. B. Satyanarayana
- Economics of ADITYA – India’s First Solar Ferry by Mr. Sandith Thandasherry
- Algorithmic Music Composition by Dr. Rangarajan Krishnamoorthy
- Commercial Buildings and Energy Conservation Building Code of India by Dr. N. Subramanian
- Robotic Process Automation – Doing It Right first time! By Mr. M. Ramkumar & Mr. Chandrashekar Sadashivaiah
- Kerala Floods - A Model of Rescue and Rehabilitation using Information Technology and Social Media based Crowdsourcing by Sebin Sabu & Nora Elizabeth Joby
- Story of keralarescue.in -- A report by Mr. Muralaedharan Manningal
- Review of Momo attack in WhatsApp by Mr. S. Manikandan
- International Genetically Engineered Machine (iGEM) Competition -- Language Project by Team iGEM-IIT Madras
- Understanding Waste Management – Part 3 by Mr. Alok Kumar
- Start-ups – Founders Cardinal Rules by Dr. L. S. Subramanian
- Work Practices To Make The Best Of Your Time by Dr. M. Sasikumar

We are happy to have published the following excerpts from books with the permission of the authors & publishers.

- “The Karma of Business” from the book Disrupt and Conquer: How TTK Prestige Became a Billion-Dollar Business
- The second part of the chapter 10 – “Leading Science and Technology: Vision for the Future” dealing with “What India Needs to Do?” from the book Leading Science and Technology: India Next?

As usual, the Chairman message by Dr. Sivaji Chakravorti is concise and comprehensive. The IT in Jul-Sep 2018 by Prof. S. Sadagopan, Director, IIIT Bangalore, the regular column in ICNL provides a broad overview on various important happenings in the IT and Telecom sectors in India during the third quarter of 2018. We are sure that readers will find the information and the related links provided in the column “Information Resources” compiled by the editor Mr. H.R. Mohan will be of interest to ICNL readers. We wish to add that “Interesting Reads”, a regular blog post published once in 5 days by him may interest our readers. The archives of these blog posts can be accessed at <https://goo.gl/VGXizd>

We have also included briefs on six books -- Disrupt and Conquer: How TTK Prestige Became a Billion-Dollar Business, Software Testing: Effective Methods, Tools and Techniques, Knowledge Driven Development – Bridging Waterfall and Agile Methodologies, Software Wasteland: How the Application-Centric Mindset is Hobbiling our Enterprises, The Forward-Looking Manager in a VUCA World, and Evolving Innovation Ecosystems: A Guide to Open Idea Transformation in the Age of Future Tech.

We request the readers to make note of the announcements on INDICON 2018 at Coimbatore and register early and get benefited. We wish to remind our members to renew the membership for the year 2019 in time and continue to get the benefits without interruptions.

ICNL thanks the various Internet sources and inshorts (<https://www.inshorts.com>) for the information nuggets. ICNL wishes to add that the articles published in this issue are not peer reviewed and are also not checked for plagiarism for which the authors are responsible. Further, the views expressed in these articles are that of the authors and ICNL is not responsible for any consequences of using the information provided in these articles.

## IEEE Bombay Section Events

### Tutorials cum Workshop on AI&ML

IEEE Bombay Section in collaboration with the India Council has organised a day-and-a-half long ‘Tutorials cum Workshop on AI&ML’ during 10-11 Aug 2018. This is the second edition in the series, the first was held in Philips Innovation Center, Bengaluru on September 6, 2017. The local host and the venue for this edition is the Centre for Technology and Innovation Management, NITIE, Mumbai. The event was supported by the IEEE Technology and Engineering Management Society (TEMS) as well as the Standards Association (SA).



Artificial Intelligence is an attempt to make computers as smart, or even smarter than the human beings. It's about giving computers human-like behaviors, thought processes, and reasoning abilities. Machine Learning, Neural Networks, Deep Learning, Natural Language Processing give machines power to make decisions. Machine Learning is an AI technique concerned with learning insights from data and using them to make predictions about the world. Artificial neural network is a technique inspired by how our brain's neurons function. Deep Learning essentially is a set of methods for training multilayered artificial neural networks. Deep Learning methods continue to dominate the field of machine learning and have wide range of applications such as self-driving cars, image processing, video analytics, healthcare, industrial automation, data analytics etc.

In these tutorials cum workshop, distinguished researchers as well as experts from industry and academia gave insights on AI, machine learning and deep learning frameworks, algorithms and applications of ML and DL in different sectors. They also covered challenges and opportunities using these cutting edge technologies.



The tutorial sessions were excellently conducted on “Deep Learning for computer vision” by Prof. Santosh Chapaneri (St. Francis Institute of Technology, Borivali) and on “AI and Hands-on on Machine Learning” by Dr. Shaunuk De, Indian Institute of Technology Bombay.

The workshops were delivered on “Enabling Digital Supply Chain: A System Perspective” by Dr. Rahul Altekar (SAP India, Mumbai), on “AI in Defence Systems” by Mr. R.Muralidharan & Mr. Sunil Chomal (Tata Power, Mumbai), on “Text Analytics” by Dr. Prakash Pimpale (CDAC, Mumbai), on “AI, ML and RPA: Is this the right time?” by Mr. Abhay Phansikar (IEEE Bombay Section), on “Applications of Cognitive Computing” by Mr. Devesh Rajadhyax (Cere Labs Pvt. Ltd.) and on “A framework for Chatbot design for FinTech Services” by Mr. Vishal Vachhani, Recommender Labs.

The Organising Committee members of this fruitful event are B. Satyanarayana (VC (TA), IEEE India Council & Secretary, IEEE Bombay Section), Sri Chandra (Sr. Director, Standards & Technology, IEEE India), Munir Mohammed (Sr. Program Manager, IEEE India) Mukundan R (Faculty, CTIM, NITIE), Chintan Oza (Chair, TEMS, IEEE Bombay Section) Mukund Sathe (Webmaster, IEEE Bombay Section), Anand Gharpure (Jt. Secretary, IEEE Bombay Section) and Ruchita Gupta (Coordinator, CTIM, NITIE). The Committee would like to thank Prof. Karuna Jain (Director), Prof. Hema Date (Dean, Student Affairs), Prof. Vivekanand B. Khanapuri (Dean, Academics) and Prof. Shirish Sangle (Dean,

Sponsored Research and Industrial Consultancy) as well as the student volunteers - Vipul Gandhi, Jayadeep Babariya, Arjun Prasad, Pratima Bhagat and Durgesh Jaiswal - all from NITIE.

The participated audience mainly comprised of data scientists, data analysts, automation, manufacturing, finance and other industry application users, faculties and students. About 150 participants in all have attended the event. Having done two such events successfully, a 'recipe' is now established to replicate this event in other Section geographies as well.



For more details, please browse the event's web page at <http://ieeebombay.org/event/aiml2018/>

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### **IEEE Foundation Event: Furthering Indian Perception of IEEE**

First set of events of the 'Furthering Indian Perception of IEEE' project sponsored by the IEEE Foundation went underway in Mumbai. Future events under this project will be hosted at various Section geographies under the India Council.

Soft-landing on the Moon is an unbelievably challenging feat that only the USA, USSR and China have achieved via national space programmes with billion-dollar budgets and decades of prior space experience. India's aerospace startup Team - 'Indus', is attempting this technological and entrepreneurial challenge. On the Engineers Day 2018, ECA or 'Ek Choti si Asha', the micro-class exploration rover tailored to explore the lunar surface was invited to Mumbai. Team Indus engineers Prithvi Gautham, John K John and Hari Prasad Gokul shared their exciting experiences of building a moonshot – from the science and engineering behind the mission to the challenges of building a spacecraft and a space-grade rover. They demonstrated a working rover along with exotic materials and instruments designed as part of the project.

Three back-to-back events were organized on three consecutive days for different types of audience as detailed below.

- At Tata Institute of Fundamental Research, Colaba on Sep 14th, 2018 for Scientists,
- At Don Bosco Institute of Technology, Kurla (W) on Sep 15th, 2018 for academicians and students and
- At D. G. Ruparel College of Arts, Science and Commerce, Matunga (W) on Sep 16, 2018 for local public of all ages.



At Don Bosco Institute of Technology



At D. G. Ruparel College of Arts, Science and Commerce



### **At Tata Institute of Fundamental Research**

The response was great; about 1000 in total participated in this string of events. The event held at TIFR was also live streamed and archived on YouTube.

*Report by Dr. B. Satyanarayana, [bsn@tifr.res.in](mailto:bsn@tifr.res.in)*

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## **The 21 Irrefutable Laws of Leadership Follow Them and People Will Follow You**

The Law of the Lid: Leadership Ability Determines a Person's Level of Effectiveness.

2. The Law of Influence: The True Measure of Leadership Is Influence—Nothing More, Nothing Less.

3. The Law of Process: Leadership Develops Daily, Not in a Day.

4. The Law of Navigation: Anyone Can Steer the Ship, but It Takes a Leader the Chart the Course.

5. The Law of Addition: Leaders Add Value by Serving Others.

6. The Law of Solid Ground: Trust Is the Foundation of Leadership.

7. The Law of Respect: People Naturally Follow Leaders Stronger Than Themselves.

8. The Law of Intuition: Leaders Evaluate Everything with a Leadership Bias.

9. The Law of Magnetism: Who You Are Is Who You Attract.

10. The Law of Connection: Leaders Touch a Heart Before They Ask for a Hand.

11. The Law of The Inner Circle: A Leader's Potential Is Determined by Those Closest to Him.

12. The Law of Empowerment: Only Secure Leaders Give Power to Others.

13. The Law of the Picture: People Do What People See.

14. The Law of Buy-in: People Buy into the Leader, Then the Vision.

15. The Law of Victory: Leaders Find a Way for the Team to Win.

16. The Law of the Big Mo: Momentum Is a Leader's Best Friend.

17. The Law of Priorities: Leaders Understand That Activity Is Not Necessarily Accomplishment.

18. The Law of Sacrifice: A Leader Must Give Up to Go Up.

19. The Law of Timing: When to Lead Is As Important As What to Do and Where to Go.

20. The Law of Explosive Growth: To Add Growth, Lead Follower—To Multiply, Lead Leaders.

21. The Law of Legacy: A Leader's Lasting Value Is Measured by Succession.

## IEEE Hyderabad Section Events

### Research Workshop 2018



The Hyderabad YP and India Council organized an event “Research Workshop 2018”, an IEEE IC Branding activity during 23-24 Jun 2018 for the benefit of **IEEE** Members, Faculty & Research Scholars. It was jointly organized by IEEE Young Professionals Hyderabad, Department of CSE, JNTUH College of Engineering & IEEE India Council with the support of WIE Hyderabad.

This two days workshop was successfully conducted with lectures delivered by eminent resource persons covering the following aspects.

- How to do Reproducible Research and Publish for the Best Impact
- Industry Academia Collaboration in Research
- Art of Doing Research and Recent Trends.
- Intellectual property rights. Who, when, where, why, what and how?
- Philosophy of Research
- Maintain Health During Research
- Distinguishing Yourself Online with ORCID
- How to manage Plagiarism in Manuscripts?
- How to manage time in Research Degree - What should be the pace of research?
- PATENTING: Why, When, Where, Dos and Don'ts
- Papers, Dissertations, and Books
- Research Cycles

In addition to the above sessions, Mr. Madhav Negi addressed the gathering about Importance of IEEE and membership development

The current IEEE YP Chair Saurabh and the immediate past chair Vinit Kumar Gunjan coordinated the event and discussed about the opportunities one can avail through this research workshop.

This workshop ended on a good note with valedictory and certificate distribution and feedback from participants.

*Report by Mr. Saurabh Jain, [saurabh.jain.1988@ieee.org](mailto:saurabh.jain.1988@ieee.org)*

### Apple's \$1,249 iPhone Xs Max takes only \$443 to make

Apple's iPhone Xs Max with 256GB storage, which costs about \$1,249 in the US, carries \$443 worth of components and assembly costs, according to Canada-based firm TechInsights. The firm, which rips opens iPhones to estimate their cost, had earlier revealed that the 64GB variant of iPhone X costing \$999 took just \$357.50 to make, giving Apple a 64% margin.

## IEEE Kerala Section Events

### ICDSE-2018: International Conference on Data Science and Engineering

The three-day international conference on Data Science and Engineering (ICDSE) 2018 ICDSE was organized by the Department of Computer Science, Cochin University of Science & Technology (CUSAT) technically co-sponsored by IEEE Kerala Section during Aug 7-9, 2018. The Department hosts the biennial ICDSE Conference Series bringing together Students, Research Scholars, Faculties and people from different areas to build a platform for Research on areas related to Data Science.

ICDSE '18 kick-started with a pre-conference workshop on "Data Analytics Using MATLAB" by Ms. Alka Nair, Mathworks, Bangalore in the forenoon session. She gave an insight into the immense possibilities of the MATLAB application with hands-on exercises for participants on building and deploying data analytics products. The afternoon session was a hands-on session on "Build Voice Enabled Experiences with Alexa" by Mr. Sohan Maheshwar the Alexa evangelist at Amazon Bangalore. Both Workshops ignited the research interests for students, research scholars, and faculties attending the event. The workshop focused on building applications using Amazon Alexa, the virtual assistant from Amazon which can assist us in many tedious tasks at homes and office by leveraging the power of AI and Machine learning. The session helped the participants to build a basic voice controlled app, which offered an opening to the world of possibilities in the platform.



The inauguration of ICDSE 2018 was on 8<sup>th</sup> August. Prof. Santhosh Kumar G, HoD of Computer Science, CUSAT welcomed all the guests and delegates. He gave a briefing on the legacy of the conference which started in 2012 and the acceptance gained by the conference through the past years. The presidential address was delivered by Prof. Poulouse Jacob, Former Pro-Vice Chancellor, CUSAT. He spoke about the relevance of data science and how the conference chose its theme, topic and the difference between Data Science and Data Engineering with an analogy of aircraft adopting concepts from science and technology that acts in a complementary manner. Further, he shared the scope of big data, along with the ethical issues

in utilizing these data and compliances to be followed. ICDSE 2018 was inaugurated by Dr. J. Latha, honourable Vice Chancellor, CUSAT. In the inaugural address, she congratulated the team behind ICDSE for achieving its success and recognition. Dr. Jayant Haritsa felicitated the gathering. He appreciated the foresight of the faculties of DCS in starting this conference in 2012 and taking it forward in a systematic format. He stressed that Data is the new oil, which is the fuel for the information economy. All decisions are to be taken based on this data". Dr. Suresh Nair, Past Chair of IEEE Kerala section felicitated the team of DCS in achieving and maintaining the acceptance rate of the conference according to IEEE standards. He also mentioned the protocols to be followed to get a collaboration with IEEE, to conduct the conference. Dr. Sunil Narayankutty, Dean of Faculty of Engineering complimented the team DCS for maintaining the series of conference highlighting the difficulty in conducting a conference and maintaining it. Dr. Philip Samuel gave the vote of thanks to all the dignitaries on the dais.

The keynote address was by Prof. Jayant Haritsa, IISc, Bangalore on the topic "Plan Bouquets: A fragrant approach to robust query processing". In this talk, he introduced a conceptually new approach to address the selectivity estimation problem, wherein this process is completely eschewed for error-prone selectivities. A small "bouquet" of plans is identified from the set of optimal plans in the query's selectivity error space, such that at least one among this subset is near-optimal at each location in the space. Then, at run time, the actual selectivities of the query are incrementally "discovered" through a sequence of partial executions of bouquet plans, eventually identifying the appropriate bouquet plan to execute. Prof. Asharaf from IITMK, Trivandrum delivered the invited talk on "Block chain for Big Data". He highlighted the relevance and potential of leveraging the block chain technology in big data problems. The talk threw light into the applicability of block chain based big data management/analytics infrastructure in both business and governance related domains. Mr. Rajeev Azhuvath, TCS, Kochi given a talk on "Automation vs Augmentation: The AI Dilemma" highlighting the fact that Artificial General Intelligence is expected to conquer in the next couple of decades. Ms. Zahida Vaseem from Mathworks also talked on Artificial intelligence with the highlights on AI capabilities of Matlab product. Dr. Bindu Narayan explained how recommendation systems are built and how digital marketing is done with the help of Data Science. Dr. Deepak Padmanabhan, Queens University, Belfast, UK enlightened the audience with a session on "Can data science combat fake news?" He described the latest research that is going on in the field of identifying fake news spread on the social media.

The three days were packed with full of informative talks, workshops and paper presentations and around 250 participants from within India and different parts of the globe attended the conference. It was a big opportunity for researchers and academicians to share their contributions to the field of data science and engineering.

The Department of Computer Science has been in the forefront to bring the benefits of Data Science to the society since the inception of this Conference series. The Department evolved PG Courses exclusively focussed on Data Science topics. There are numerous research scholars working on diverse areas related to Data Analytics, Deep learning, Computer Vision, Internet of Things and Cyber-Physical Systems. This biennial International Conference (fourth in the series) discussed the recent trends and development in the globally competitive environment, and share the best practices and technologies as well as to provide indicators for future directions. ICDSE 2018 edition was sponsored by DRDO, Mathworks and Fujitsu.

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### IEEE WIE International Leadership Summit-2018



IEEE WIE ILS 2018, the 2-day leadership summit of IEEE WIE was held at the picturesque location of the Le Meridian Hotel, Cochin, Kerala, India, in the presence of an eminent group of dignitaries, delegates and leading lights of the society, along with various national & international establishments, on September 7th and 8th 2018. For the summit, IEEE Kerala Section selected the theme 'emPOWERing TOgetHER' in the light of its relevance in the global push to improve women's rights, at the anniversary of the #TimesUp movement that swept across the world.

IEEE is the world's largest fraternity within the engineering community, with over 400,000 members in 150 countries around the world. IEEE is mandated with several important scientific and technical responsibilities including creating and maintaining technical standards; providing publishing services for scholarly papers; organizing technical conferences; providing technology for humanitarian and social purposes; and providing professional services for members. IEEE WIE remains the largest network of female engineers in the world with over 90,000 active members world wide. It was with this foreground that IEEE WIE ILS 2018 started off in Kerala.

IEEE WIE International Leadership Summit Kochi 2018, hosted by WIE Affinity Group, IEEE Kerala Section was inaugurated on 7th September 2018 by Ms. Soumini Jain, the Hon. Mayor of Cochin Corporation, marking a milestone for IEEE Kerala Section WIE. Prof. Lillykutty Jacob, the General Chair, welcomed the chief guest, the 30-odd eminent speakers, 150+ delegates and other invited participants. She acknowledged the tremendous support from various sponsors for the successful execution of the event: UST Global, GE, Cochin Shipyard, CISCO, Allianz, Kerala Start-up Mission, NeSTIT, and the IEEE Societies – IAS, PES, APS, and CS. She also specially mentioned the appreciation for IAS sponsoring 38 student delegates including their stay. The two-day Summit was the meeting point of researchers, engineers, students, academicians, practitioners, industrialists and the government officials who set out to explore the possibility of inviting more women into leadership positions, by learning from accomplished professionals.

The Summit saw the top international leaders from IEEE and Region 10 (Asia Pacific), as well as representatives of IEEE Sections in different parts of South Asia. IEEE WIE ILS 2018 featured high quality knowledge sharing sessions, workshops and industry sessions, as well as keynotes from prominent research and industry leaders. The keynote speakers included Dr. Mini Thomas, Director NIT Trichy, Dr. Takako Hashimoto, past WIE Global Chair, and Dr. Lizy Kurian John, IEEE Fellow and Professor at University of Texas. The Summit had a wide ranging list of prolific women speakers to inspire live action, and fuel up creative fires and experiences, that spanned over six disciplines: Leadership & Empowerment, Innovation & Entrepreneurship, Science & Technology, Sustainable Developments, Change Makers & Off-Beaten; and Health & Wellness. The deliberations were also substantiated by a Panel Discussion with the theme Women Leadership among Technologists, a WiC (Women in Computing) Track, a WiP (Women in Power) Track, and a 5G workshop by Cisco. The event concluded on the evening of 8th September with an open forum and a short valedictory session.

The main attractions for the attendees, delegates and speakers alike were the cultural events on Friday evening and the women-only hands-on self-defence session on Saturday afternoon. The Bharatanatyam dance performance by Retd. Prof. Gayatri V, a WIE member, enchanted the audience. The precise swordplay of Kalaripayattu, an ancient martial arts form native to Kerala, by Padmashree Meenakshi Amma along with her granddaughter, kept the audience at the edge of their seats. The hands-on self-defence session hosted by the Kerala Police received tremendous response from the audience, all thanks to the wonderful presentation by the host team.



The speakers collectively emphasised on the lack of women in higher positions of all the leading companies and how women shy away from exceptional opportunities because they are too afraid to step out of their comfort zones. To break the barriers, the first step has to be taken; without which the shackles would never be released.

The Summit became a fruitful platform for the dignitaries, panellists, industrialists and researchers to share their thoughts on how to learn from industry pioneers and women in positions of power. The Summit also provided an opportunity to showcase Kerala's strong line of women leaders and their achievements.



The event received uniformly positive feedback from its participants, including IEEE dignitaries from India and abroad, representatives of IEEE Sections in India, speakers and delegates. Special commendation was given to the team for organizing a successful event of such stature in spite of the devastation the state has followed just days earlier. It just proved to be yet another epitome of the legacy of the volunteers of IEEE Kerala Section.

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### **TKMCE SUPPORTS “MISSION RECONNECT” OF KSEB**

One night. That one night of 2018 monsoon changed Kerala's face. Atrocious downpour spanning the entire state brought Kerala to an absolute standstill with people crushed by debris and pulled underwater. Kerala has just overcome the disaster. Yet, there is a long way to go on rebuilding.

Taking into account the woes of our brethren, IEEE SB TKMCE in partnership with Department of Electrical and Electronics Engineering, TKM College of Engineering, Kollam took part in the “MISSION RECONNECT” programme of KSEB. The students, alumni, faculty and staff of the Department joined hands with KSEB in restoring electricity to the flood hit and submerged houses of Kuttanad, Chengannur and Pathanamthitta areas. The experts from Electrical Inspectorate, KSEB and IEEE lent quality support for this venture.



The students prepared 610 temporary electrical connection boards consisting of isolator, ELCB, a lamp holder, a 3-pin power socket and an LED indicator. These boards were used to connect electrical supply from KSEB's service main board avoiding the damaged wiring of the houses.

This noble mission started with the concern experienced by the KSEB officials who were finding it difficult to charge the houses which were submerged in water for several days. The discussion of the Electricity Board Engineers with the Head of the Department, Dr. Bijuna Kunju K, gave the idea of producing such boards in a short period of time. The complete stake holders of the college expressed their gratitude to the complete team behind this endeavor.

Ms. Sunitha Beevi. K, Assistant Professor, expressed her deep content on the fact that due to this small venture we are able to bring light for the people who were suffering from the devastating flood. Mr. Hany S. F, the instructor of the Department, pointed out that this temporary board will be most beneficial to the most underprivileged section of the society.

Students were excited at the opportunity to volunteer themselves for the flood affected people. Mr. Sourabh, Second year student was overwhelmed at the completion of 100 boards in one day. Mr. Rahul, Final year student, was eager to deliver his efforts and time using his technical skills for the rehabilitation of the flood submerged households.

The alumni of the college generously contributed approximately ₹ 9 lakhs to provide the individual units costing around Rs. 2000. KSEB appreciated the students and faculty for the service offered in connection with 'Mission Reconnect' programme by manufacturing and supplying temporary connection boards free of cost on war foot basis.



A team of faculty, electrical contractors and 53 final year students visited Pandanad region in Chengannur to give an awareness on ensuring electrical safety. They were able to counsel more than 100 families on safety tips before switching on electrical main switches or house hold appliances.

Electrical Department also carried out electrification in Aythala region in Pazhavangadi Panchayat, Ranni. A group of 25 faculty members and staff along with student volunteers helped to restore power in 20 flood ravaged homes using the temporary power boards.



The students wholeheartedly participated in this noble venture to pull out the ferrying people from their loss and distress.

Report by : Harry Paul, Chairman, IEEE SB TKMCE, [harry97@ieee.org](mailto:harry97@ieee.org)

### **JalaJyothi IEEE**

Recently Kerala suffered one of the most catastrophic floods in history. About 400 people died, several livestock lost and 145,000 families are reported to be moved to Relief Camps. Severe flooding occurred due to two reasons. Firstly, we had one of the highest quantity of rainfall in living memory (264% of normal rainfall during the 10 days from August 8, which was in continuation to the heavier than normal rainfall starting from 28 May 2018) and Secondly, most of the nearly 80

dams in the State had to open their shutters as they had reached their designed carrying capacity and the inflows were abnormally swift and high.

IEEE Kerala Section Volunteers known for their Disaster Response in many areas of the world including Nagapattinam, Nepal and Puerto Rico had for the first time a disaster in their own hands. True to their spirit, they fanned out into the affected areas and have done wonderful work from actually ferrying people out of the disaster zone to distributing food, dress and medicines to the relief camps.

#### The Rescue Phase

**KeralaRescue.in:** The Kerala Government Website for handling the disaster relief operations with the database of the needs of the people was developed and maintained by IEEE Volunteers, mainly students. Thus IEEE is in the midst of the rescue and relief operations. (<http://keralarecue.in>). This site carried IEEE name prominently and thus gaining recognition for IEEE among the entire population of the State.

**WhatsApp Groups:** District Wise groups were formed on WhatsApp to coordinate the activities of the Government. The District Officials, District Collectors (Administrative head of a district) and District Project Managers were a part of the groups and these groups became the effective communication Channels during the flood.

**Relief Camps:** As soon as the relief camps were setup, IEEE members, especially the IEEE Students from SBs, joined the camps as volunteers offering their services. More than 1000+ camps had IEEE members as volunteers.

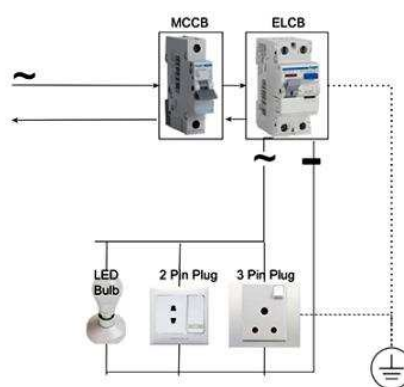
#### The Rehabilitation Phase

With the ending of the rescue phase, our members started helping the affected people back into their houses. As our members were in the field, we noticed an area that required our engineering skills.

#### The Reconnection Boards

Most of the submerged buildings have their electrical wiring soaked and unusable. In order to reconnect the wires to the grid most of the wiring will have to be redone. This is a difficult work and would take a long time. At a discussion with the Electricity Authority, **IEEE members** put forward a plan to develop a temporary connection board to which the grid could be reconnected. This will take much less time and the people could be re-habilitated much sooner.

#### IEEE Designed Reconnection Boards



#### Components and Circuit Design

The design of the Boards were very simple and consisted of an MCCB, ELCB, two electrical sockets and a bulb. With this any household could start a simple electrical connection and extend it using the sockets. The ELCB ensured a safe tripping of the circuit. The IEEE Design for boards was quickly approved by the Kerala State Electricity Board and publicised state-wide for mass development.

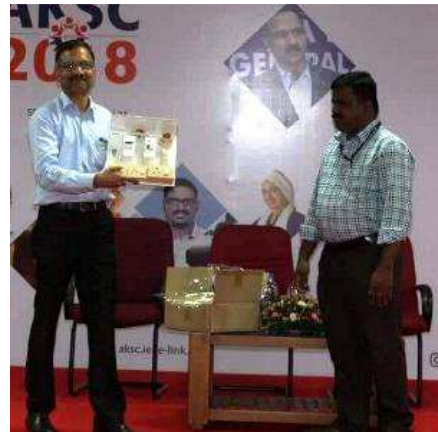


#### Assembling of the Boards

We as a Section also wanted to contribute to this effort and intend to offer the Reconnection Boards cost free to 2000 underprivileged families in the worst affected districts and help them restore power connections. Many Engineering Colleges took the IEEE design and started assembling the boards and delivering them to the local KSEB offices. The most notable work was done at the TKM College of Engineering under the leadership of Prof. Bijuna Kunju and at the National Institute of Technology under Prof. Mini Thomas and Prof. Bhaktavalsalam. Many other colleges also independently worked on creation of the

Boards and these were handed over to the KSEB for proper installation. The KSEB is installing these boards at the houses of the most poor and needy people.

## Handing over to KSEB



The Boards were formally handed over to the Kerala State Electricity Board at the functions held at the venue of the All Kerala Student's Congress.

## Thanks

We would like to thank the entire contingent of Students who helped in the rescue and relief efforts. Not naming anyone for the fear of missing out many. We would like to thank the Students of NIT Trichy who not only assembled Boards but also contributed to the donations of more than Rs. 5,00,000. Their contribution now stands as the single largest donation so far. We would like to thank the IEEE Nepal for calling us on the first day and promising Rs. 1,00,000 for the Kerala Relief efforts. We would also like to thank Harish Mysore and the IEEE India Office for advancing money immediately and coordinating with the vendors for all the supplies.

## Core Work Related Skills for Future Jobs

Abilities	Basic Skills	Cross-functional Skills	
<b>Cognitive Abilities</b> <ul style="list-style-type: none"> <li>» Cognitive Flexibility</li> <li>» Creativity</li> <li>» Logical Reasoning</li> <li>» Problem Sensitivity</li> <li>» Mathematical Reasoning</li> <li>» Visualization</li> </ul>	<b>Content Skills</b> <ul style="list-style-type: none"> <li>» Active Learning</li> <li>» Oral Expression</li> <li>» Reading Comprehension</li> <li>» Written Expression</li> <li>» ICT Literacy</li> </ul>	<b>Social Skills</b> <ul style="list-style-type: none"> <li>» Coordinating with Others</li> <li>» Emotional Intelligence</li> <li>» Negotiation</li> <li>» Persuasion</li> <li>» Service Orientation</li> <li>» Training and Teaching Others</li> </ul>	<b>Resource Management Skills</b> <ul style="list-style-type: none"> <li>» Management of Financial Resources</li> <li>» Management of Material Resources</li> <li>» People Management</li> <li>» Time Management</li> </ul>
<b>Physical Abilities</b> <ul style="list-style-type: none"> <li>» Physical Strength</li> <li>» Manual Dexterity and Precision</li> </ul>	<b>Process Skills</b> <ul style="list-style-type: none"> <li>» Active Listening</li> <li>» Critical Thinking</li> <li>» Monitoring Self and Others</li> </ul>	<b>Systems Skills</b> <ul style="list-style-type: none"> <li>» Judgement and Decision-making</li> <li>» Systems Analysis</li> </ul>	<b>Technical Skills</b> <ul style="list-style-type: none"> <li>» Equipment Maintenance and Repair</li> <li>» Equipment Operation and Control</li> <li>» Programming</li> <li>» Quality Control</li> <li>» Technology and User Experience Design</li> <li>» Troubleshooting</li> </ul>
		<b>Complex Problem Solving Skills</b> <ul style="list-style-type: none"> <li>» Complex Problem Solving</li> </ul>	

Source: World Economic Forum, based on O\*NET Content Model.  
Note: See Appendix A for further details.

Source: [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf)

## IEEE Madras Section Events

### Kumaraguru College of Technology, Coimbatore: IEEE SS12 -- International Project Competition: Prelims for the Junior Einstein track



IEEE SS12 is an International Project Competition organized by Madras IEEE Education Society chapter in partnership with IEEE Societies. The event is planned annually and this year it has four tracks - Innovation Challenge, Maker Fair, Junior Einstein and Virtual Track. The finals will be held on September 8th and 9th at NSBM Green University, Colombo, Sri Lanka. Junior Einstein Track was included this year to encourage the school students of age 12 – 17 years to take part in the finals to be conducted in Colombo, Sri Lanka. The theme of this year competition is ‘Empathy to Engineering: Solution for Macro Issues’. The theme Empathy to Engineering through innovation aims to make STEM education an interesting path to be followed by the school students to enhance their creative thinking. Under this the projects can be Mobile Apps or Computer Based or IoT based pertaining to any of social issues in the areas of UN sustainable Development Goals.

The prelims for the Junior Einstein track was organized by Madras IEEE Women in Engineering in four different zones - Tirunelveli - Nagercoil zone, Coimbatore zone, Chennai zone and Erode Zone. The IEEE Students Branch of Kumaraguru College of Technology hosted the Coimbatore Zone prelims in partnership with IEEE SSIT on 10<sup>th</sup> Aug 2018 at Kumaraguru College of Technology.

Nearly 31 teams participated from 10 schools in and around Coimbatore. The projects presented covered a plethora of societal issues on environment, food production, smart agriculture, healthcare, safety and security, Governance and many other areas. With around 100 students from various schools competing for the prize of partial travel grant of Rs.10,000/- offered by Madras IEEE Women in Engineering, it was a great learning not only for all involved school students but for the IEEE Members and student volunteers as well who were involved in the conduct of the event..

The winners of JE track had a novel Project model titled “Smart Trash Can” designed to monitor and manage the waste generated from various parts of the district as a smart city initiative. The design was practically demonstrated along with necessary explanatory posters. A partial travel grant of Rs 10,000/ per team to participate in the finals was announced for four teams from Coimbatore Public School, Stanes AIHSS and Vivekam Sr. Sec School. Ten other teams were recommended to participate in the finals to be held at Columbo, Sri Lanka.

It is also decided to create the data base of the projects and help the interested teams with incubation or industry mentorship. This phase will be started soon. They were informed about the mentor for JE track Dr Purushothaman, ISRO to have any critical clarifications during their consistent effort in preparing themselves for the finals.

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### Awareness Program on IEEE & IEEE CS & Membership Drive

The IEEE Computer Society Madras Chapter, to promote the membership in IEEE and IEEE Computer Society, had organised IEEE & IEEE CS awareness programs at **M A M College of Engineering and Technology**, Trichy on 2<sup>nd</sup> Aug 2018. Mr. H.R. Mohan, Former Vice Chairman, IEEE Madras addressed the faculty and students on IEEE & its technical chapter and highlighted the benefits of membership in IEEE. Dr P. Sakthivel, Chairman, IEEE Computer Society, Madras Chapter in his address provided an overview of the IEEE Computer Society and the membership benefits of IEEE CS and encouraged the students and faculty to join

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**Microsoft on Monday partnered with the Data Security Council of India to launch a three-year programme, called CyberShikshaa, to train 1,000 women from underserved communities in cybersecurity. They will be trained in ten locations including Rajasthan, Karnataka, Delhi-NCR and will also be offered employment opportunities.**

## IEEE CS Madras supported International Conference on "Blooming Trends in Tech Challenges and Opportunities" at National College, Trichy



The PG & Research Dept. of Computer Science, National College, Trichy, organized a three day International Conference on "Blooming Trends in Tech Challenges and Opportunities" during 27-29 Sep 2018 as a part of the centenary celebrations of the college. The conf. was supported by IEEE Computer Society, Madras Chapter. At the inaugural session on 27<sup>th</sup> Sep Dr. P.S.S. Akilashri, Vice Principal & HoD, CS welcomed the gathering.

Prof. S. Sivakumar, Principal In-Charge, National College, delivered the Presidential Address. Thiru. M. Chandrasekaran, AGM, BSNL, Madurai, delivered the inaugural address. Dr. E. Kirubakaran, HoD/CSE, Karunya University, Coimbatore, felicitated. Dr. Gopinath Ganapathy, Registrar, Bharathidasan University, Trichy, delivered the keynote address. The conf. proceedings were released by Sri. K. Raghunathan, Secretary of the college and the copies were received by Mr. H.R. Mohan, Past Chair & Chair – Special Events, IEEE CS, Madras and Dr. V. Lakshminarasimhan, Professor, Dept of CS, University of Botswana, South Africa. At the end of the inaugural function Prof. M. Umamaheswari, Vice President, Dept of CS proposed a formal Vote of thanks.

On Day I (27.09.2018), the conf. had the following plenary keynote talks.

- "Emerging Trends in Artificial Intelligence" by Mr. H. R. Mohan, Past Chair & Chair – Special Events, IEEE CS, Madras and Former Vice-Chairman, IEEE Madras Section
- "Blooming Technologies and Hidden Challenges". by Dr. V. Lakshminarasimhan, Professor, Dept. of CS, University of Botswana, South Africa.
- "Internet of Things" by Dr. T. Arunkumar, Professor, School of Computer Science & Engineering, VIT University, Vellore.

The Faculty members, Research Scholars and Students presented their papers in the technical sessions. In the evening, a colorful and memorable cultural consisting of Classical Dance, Western Dance, AdZap and Magical Show was organized. This was well appreciated by the Resource Persons, Chief Guests, student participants and staff members from Computer Science and various departments.

On Day II (28.09.2018) in the Plenary keynote talk Dr. E. George Dharma Prakash Raj, Assistant Professor, Department of Computer Science, Bharathidasan University, Trichy, enriched the participants on "Data Mining and Analytical Tools". Student participants, Speakers and staff members went on a tour to the historical places like Rockfort, Arulmigu Jambukeswarar Akhilandeswari Temple and Grand Anicut as a part of the Conference.

On Day III (29.09.2018), the Plenary keynote talks were presented.

- Mr. R. Ravishankar, Senior Consultant, Tata Consultancy Services (TCS), Chennai on "Cloud Migration".
- Dr. N. Ramasubramanian, Professor, Dept. of CS, NIT, Trichy on "Future Generation Computing System".
- Dr. M. J. Shankararaman Professor, Dept. of CSE, IIT Madras on "Latest Trends in Communication Networks" and "Sakthi-Make in India Initiative".

The Valedictory session held in the afternoon, Dr. P.S.S. Akilashri, Vice Principal & HoD, CS welcomed the gathering. Dr. R. Sundararaman, Principal, National College, Trichy, presided. Prof. S. Ramani, HoD/IT, summarized the Conference report. Dr. M. J. Shankararaman, Professor, Dept. of CSE IIT Madras delivered the Valedictory address. Dr. V. Lakshminarasimhan, Professor, Dept of CS, University of Botswana, South Africa and Dr. V.M. Ananthanarayanan, HoD/Sanskrit, National College, Trichy felicitated. Best Paper award was given to Ms. A.V. Anjali of NIT, Trichy. Certificates were presented to all participants. Dr. R. Sasikala, HoD/Computer Applications proposed a formal Vote of Thanks.

Out of over hundred papers received, fifty five were shortlisted and included in the conf. proceedings. The conf. attracted 130 participants from all over the country and few from abroad. 23 Faculty members of the Department of Computer Science, Computer Application and Information Technology worked together to make this International conference a grand Success.

## Awareness Programs on IEEE & IEEE CS & Membership Drive and ICT Quiz

The IEEE Computer Society Madras Chapter, to promote the membership in IEEE and IEEE Computer Society, had organised IEEE & IEEE CS awareness programs at **Saranathan College of Engineering**, Trichy on 30<sup>th</sup> Aug 2018 and at **Srimathi Indira Gandhi College**, Trichy on 26<sup>th</sup> Sep 2018.

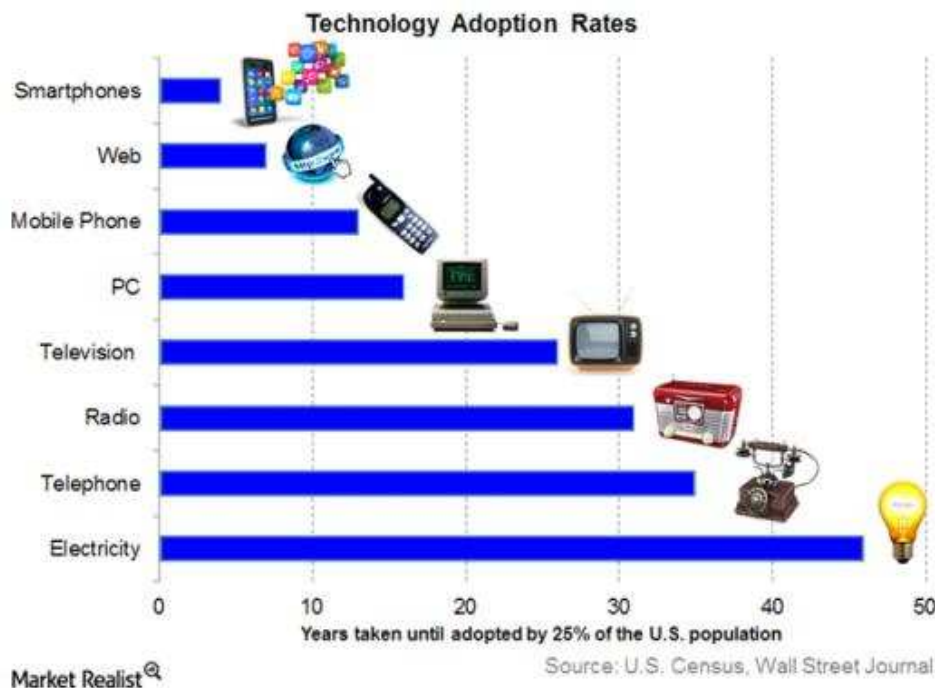
Mr. H.R. Mohan, Former Vice Chairman, IEEE Madras and Past Chair & Chair – Special Events, IEEE Computer Society Madras addressed the faculty and students on IEEE & its societies and highlighted the benefits of membership in IEEE and IEEE Computer Society and urged them to join. He had also conducted an interactive ICT Quiz to the students. IEEE CS sponsored the cash prizes to the participants answered the questions and motivated them.



*At Saranathan College of Engineering, Trichy on 30<sup>th</sup> Aug 2018*



*At Srimathi Indira Gandhi College, Trichy on 26th Sep 2018.*



## IEEE UP Section Events

Rajkiya Engineering College Mainpuri

### Writing and Poster drawing Competetion



**ABILITY is what you're capable of doing**  
**MOTIVATION determines what you do**  
**ATTITUDE determines how well you do it**

To enhance the ability, to motivate the students & to build positive attitude in today's youth it's a great responsibility of the institutions to provide the students a stage. So in order to serve the purpose, on 18<sup>th</sup> Aug 2018, Rajkiya Engineering College, Mainpuri IEEE-WIE Student Branch affinity group organised the "Article Writing (Women Education) and Poster Making (Save Girl Child)" competitions for pre-university students. Students from higher secondary schools and secondary schools visited the campus of their district's government engineering college, Mainpuri where they gained lots of information and got best opportunity to show their ensuing talents. Students were immense creative and it was a difficult task for the jury members to choose the best among them.

In order to enhance the confidence level of the participants and to appreciate their hard work, certificates of participation were distributed to all the participant and the winners were given the emblem of IEEE as a reward.

The valedictory session of the event was addressed by Prof. Aseem Chandel students were well counselled for choosing right career for their bright future and understand their social responsibility towards humanity. Student participants also interacted with Student Branch officers and other IEEE members; who curiously solved all the queries of the students and assured them to provide such opportunities again in future.

The complete ceremony was managed by enthusiastic contribution of Student Branch volunteers under the guidance of Prof. Sachin Pachauri (IEEE-WIE Affinity Group Advisor) and with the support of faculty/staff /IEEE members of Electrical Engineering Dept.

Honourable Director of the institution Prof. B. N. Rai expressed his delight on this auspicious accession and assured to provide such platforms to all the students so that in this era of grand competition; students may get the opportunity to rise high.

Report by: Aseem Chandel, [aseemchandel@ieee.org](mailto:aseemchandel@ieee.org)

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**Alibaba builds robot that talks, serves food to hotel guests. The robot features an autonomous navigation system to identify and dodge obstacles, a communications system to control elevators and facial-recognition technology.**

**Researchers have developed a tiny, soft robot with caterpillar-like legs that can deliver drugs inside a human body.**

**A functioning ₹48,000 Apple-1 computer built by Co-founders Steve Jobs and Steve Wozniak fetched around ₹2.7 crore at an auction by US-based RR Auction. This Apple-1 is one of the 60-70 remaining from the original 200 that were built in 1976 and 1977. It was restored to its original, operational state in June 2018 by Apple-1 expert, Corey Cohen.**

**US-based company Athena Security has developed a camera system that uses artificial intelligence (AI) and cloud technology to spot guns in a crowd with 99% accuracy.**



## IEEE-RASC: IEEE Robotics and Automation Society Congress



Robotics and Automation Society Chapter, IEEE Student Branch at Quantum School of Technology, Roorkee had organized a two days IEEE Robotics and Automation Society Congress during 21<sup>st</sup> and 22<sup>nd</sup> September 2018. This congress was organized for the first time in India sponsored by IEEE Robotics and Automation Society, USA.

In the inaugural session of the Congress, Prof. (Dr.) Vivek Kumar, Hon'ble Vice Chancellor, Quantum University, Prof. (Dr.) Gulshan Chauhan, Director, Quantum School of Technology, Prof. (Dr.) Rohit Kushwaha, Director, Quantum School of Business, Mr.

Raunak Gupta, Branch Counselor, IEEE Student Branch, Mrs. Jaspreet Srivastava, Faculty Advisor, W.I.E Affinity Group, Mr. Suresh Yaram, Advisor – System Architect, DXC Technology India Limited, Hyderabad, Dr. Rahul Kala, Assistant Professor, Robotics and Artificial Intelligence Laboratory, Indian Institute of Information Technology, Allahabad participated along with SB members, faculty and participants from different states of India .

At the inaugural session, Prof. (Dr.) Vivek Kumar welcomed all the dignitaries and participants. Then Mr. Raunak Gupta, SBC, highlighted on different activities organized by the IEEE student branch in the past in order to promote the research, development and volunteering opportunities among the audience. He also introduced the event as the first ever congress being organized in India. He informed that the congress would consist of different sessions including keynote addresses, presentation and discussion sessions and added that the top three presentations in each session would be awarded with cash prizes and the best five participants during each discussion session would be awarded with gifts.

Mr. Suresh Yaram, in his keynote address on “How AI/ML is helping the Insurance Industry globally and significant use cases” shared his industrial experience. Mrs. Jaspreet Srivastava presented the vote of thanks for the inaugural session.

The top three presentations during the 1<sup>st</sup> session include: “Multi-purpose Drone and local GPS using ML” by Mr. Devashish Patel and group from Ahmedabad University, Ahmedabad, “Technology and Human Brain – A Deadly Combination” by Mr. Pranav Agarwal from Rajkiya Engineering College, Mainpuri and “Impact of Automation in Automobile Industry” by Mr. Sahil Kumar from Quantum School of Technology, Roorkee.

In the second keynote by Dr. Rahul Kala on “Mobile Robotics – From School Projects to Real life”, the speaker addressed the various issues involved in the robotics such as trajectory planning, kinematics etc. Then first discussion session was organized on “Would Robots Replace Humans?” followed by another discussion session on “Artificial Intelligence – A threat or boon to the society?”

The top three presentations in the 2<sup>nd</sup> session were” “Driverless Cars” by Mr. Aman Shah from Rajkiya Engineering College, Mainpuri, “A Survey on Women in AI” by Ms. Rashmi Mishra from Quantum University, Roorkee and “Impact of Automation in Agriculture” by Mr. Parmeshwar Kr. Sah from Quantum School of Technology, Roorkee. All the competitive sessions of the day 1 were judged by Mr. Suresh Yaram and Dr. Rahul Kala.

On the day 2 of the congress, Mr. Arpit Agarwal, Deputy Manager – Didactic Initiatives, Janatics India Private Limited, Noida was the keynote speaker for the first keynote session of the day 2. He spoke on Industry 4.0 and shared his vast experience in handling the industry 4.0 projects. The first discussion session on day 2 was conducted on “Artificial Intelligence – Creating Unemployment?” followed by the last discussion session on “Self-Driving Cars – Safe or Threat?”.

The top three presentations during final presentation session were “Low Cost Futuristic Automation of Food Processing Machine” by Mr. Moyun Sherasiya and group from Marwadi Education Foundation, Rajkot, “Industrial Electrical Parameter Monitoring and Control System with AI Based Analytics and Prediction” by Mr. Bhavik Bhansali and group from Marwadi Education Foundation, Rajkot and “Plastic Bottle Crushing Machine” by Mr. Ashish Ranjan from Quantum University, Roorkee. The competitive sessions for the day 2 was judged by Mr. Arpit Agarwal and Dr. Rahul Kala.



The valedictory session of the congress was chaired by Prof. (Dr.) G. C. Nandi, Senior Most Professor and Dean Academics, Indian Institute of Information Technology, Allahabad. Prof. (Dr.) G. C. Nandi delivered his keynote address on “Introducing Robotics in the era of Artificial Intelligence (AI) revolution”. While sharing his vast experience in the field of robotics and artificial intelligence, he highlighted on different mechanisms of robots along with the various issues involved in the practical field. He added that a day will arrive when every household work would be done by robots in a very efficient manner. He also motivated the participants for involving in IEEE and Robotics and Automation Society as the

valued member.

At the end the certificates were distributed to the participants for participation and volunteers for appreciation. Mr. Raunak Gupta summarized the congress with the note that “IEEE student branch would continue to host such kind of events for dissemination of the knowledge among the peer community”.



Volunteers of RASC-2018

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## Wonderful English from Around the World

In a Bangkok Temple: IT IS FORBIDDEN TO ENTER A WOMAN, EVEN A FOREIGNER, IF DRESSED AS A MAN.

Doctor's Office, Rome: SPECIALIST IN WOMEN AND OTHER DISEASES.

On the main road to Mombasa, leaving Nairobi: TAKE NOTICE: WHEN THIS SIGN IS UNDER WATER, THIS ROAD IS IMPASSABLE.

In a City restaurant: OPEN SEVEN DAYS A WEEK AND WEEKENDS.

In a Cemetery: PERSONS ARE PROHIBITED FROM PICKING FLOWERS, FROM ANY BUT THEIR OWN GRAVES.

In a Tokyo Bar: SPECIAL COCKTAILS FOR THE LADIES WITH NUTS.

In the lobby of a Moscow Hotel, across from a Russian Orthodox Monastery: YOU ARE WELCOME TO VISIT THE CEMETERY, WHERE FAMOUS RUSSIAN AND SOVIET COMPOSERS, ARTISTS, AND WRITERS ARE BURIED DAILY, EXCEPT THURSDAY.

A sign posted in Germany's Black Forest: IT IS STRICTLY FORBIDDEN ON OUR BLACK FOREST CAMPING SITE, THAT PEOPLE OF DIFFERENT SEX, FOR INSTANCE, MEN AND WOMEN, LIVE TOGETHER IN ONE TENT, UNLESS THEY ARE MARRIED WITH EACH OTHER FOR THIS PURPOSE.

Advertisement for donkey rides, Thailand: WOULD YOU LIKE TO RIDE ON YOUR OWN ASS?

Airline ticket office, Copenhagen: WE TAKE YOUR BAGS AND SEND THEM IN ALL DIRECTIONS.

And finally, the all-time classic, Seen in an Abu Dhabi Souk shop window: IF THE FRONT IS CLOSED, PLEASE ENTER MY BACKSIDE

## Society Chapter Events

### The Marine Technology Society (MTS) India Section & IEEE Ocean Engineering Society

#### 2<sup>nd</sup> Techsurge2018 on “Technology and Innovation for Sustainable Fishing”



The Marine Technology Society (MTS) India Section in association with the Bay of Bengal Programme - Inter-Governmental Organisation (BOBP-IGO), Fisheries Department, Govt. of Tamil Nadu, National Institute of Ocean Technology, Chennai and IEEE Ocean Engineering Society, organized the 2nd Techsurge 2018 on the theme of Technologies and Innovation for Sustainable Fishing (TISF), at Hotel Crowne Plaza, Chennai, India on 10 August 2018.

This event is a prelude to the proposed mega event ‘Oceans’2022 to be organized by MTS and IEEE OES in Chennai, Tamil Nadu in 2022.

Dr. R. Venkatesan, Chairman MTS India & Head, Ocean Observation Systems, National Institute of Ocean Technology welcomed the gathering and spoke on the growth of MTS India Section and its success in promoting awareness, understanding, advancement and application of marine technology. He said that more than 125 delegates representing 41 organizations that include Navy, Coast Guard, Department of Fisheries and NGOs are attending the 2nd Techsurge 2018 to discuss the present and futuristic technology for Safety, Security, Navigation and Technology for sustainable fishing. The event provides them a common platform to share their views on field-level applications of the technologies and challenges.

The message provided by the Minister of Fisheries, Government of Tamil Nadu was read. The message said that fisheries sector plays a pivotal role in food supply, providing food security and also as the primary source of employment and livelihood to the coastal communities. Various development initiatives coupled with the conservation and management measures based on strong scientific principles is promoting the growth of the sector in the State.

Dr. M. A. Atmanand, Director, National Institute of Ocean Technology (NIOT), in his address said that the Techsurge aims to find high tech solutions for improving, optimizing the resource utilization, fishing expenditure and to increase the overall efficiency of the fishing sector in a sustainable manner. The Techsurge provides a platform for exchange of information on recent innovations in technologies for sustainable fishing and also the up-coming cutting-edge technologies covering areas such as safety, security and navigation, which would be very much useful to the user groups.

Dr. Yugraj Singh Yadava, Director, Bay of Bengal Programme, Inter-Governmental Organisation (BOBP-IGO) said that the need for sound technologies and innovations in fisheries, especially in the marine fisheries sector, is being felt much more now than in the past 5 – 6 decades. Increased fishing effort is leading to over exploitation of the resources. In these challenging circumstances, events such as ‘Techsurge’ can provide a platform for knowledge exchange, sharing information on field-level experiences, networking of stakeholders and practitioners operating in different fields and at different levels, and also providing an opportunity for students and young professionals to hear the developments and interact with people with wider experiences in the sector.

Two technical sessions (1) Communication for Fisheries and (2) Regulation, Experience & Safety were held and experts from Weather Dock, Germany, Inmarsat India, NIOT, CMFRI, Tamil Nadu Fisheries, BOBP-IGO, Indian Coast Guard, COBHAM SATCOM, NCCR and Norinco made presentations covering the present and the futuristic technologies for safety, security, navigation and technology for sustainable fishing.

#### Student poster competition on technology development

Student poster competition on technology development was also held during this event. Students from SRM, Alpha College of Engineering, CUSAT, Sri Sairam Institute of Technology, Chennai, Andhra University, Bannari Amman Institute of Technology, Sairam College of Engineering, Bangalore, SSN College of Engineering, New Horizon College of Engineering presented their posters.

The Jury for the Student Poster Competition announced the following awards:

- First prize to Sri Sairam Institute of Technology, Chennai for their theme on “Use of Block Chain Technology to Reinforce Sustainable Fishing”.
- Second prize to Andhra University for their theme on “Automated fish feeding and monitoring system for cage culture by using autonomous surface vehicle platform”.
- Third prize to Sri Sairam College of Engineering, Bengaluru for their theme on “Our Aquaculture Monitoring AUV”.

### Panel discussion – Technology and Innovation for Sustainable Fishing (TISF)

(Moderator: Cmde. S. Shekhar, Rapporteur: Mr. R. Sundar)

A panel discussion was held under the theme of ‘Technologies and Innovation for Sustainable Fishing (TISF)’, with Cmdre S. Shekhar moderating the session and Mr. R. Sundar, Scientist-C, NIOT as the rapporteur. The panellists included: DIG Donny Michael, TM, Indian Coast Guard; Dr. R. Kirubakaran, Former Scientist, NIOT; Dr. Y. S. Yadava, Director, BOBP-IGO; Dr. V. Sampath, Former Project Director, ICMAM; Dr. S. P. Sharma, Director, Indo-Australian Chamber of Commerce; Shri A. Antony Xavier, Dy. Director of Fisheries, Tamil Nadu; Dr. R. Narayana Kumar, Principal Scientist, CMFRI; and Dr. Tune Usha, Scientist-F, NCCR.

## Know Your Robot Types

The rate of adoption of robotics will depend, in part, on the type of robot required for a specific use case. Several types of robots exist today, each with a differing set of functionality and applications. Examples and potential uses include:

**INDUSTRIAL ROBOTIC ARMS:** Led by the automotive industry, robotic arms revolutionized manufacturing, with their efficiency at repetitive tasks requiring high degrees of accuracy and repeatability.

**COBOTS:** Collaborative robots, or cobots, are designed to operate safely around or with humans.

**MOBILE/WHEELED UNMANNED ROBOTS:** Capable of locomotion through an environment, typically using wheels.

**AUTONOMOUS VEHICLES:** Specific implementation of wheeled robots that aim to revolutionize transportation and delivery.

**HUMANOID ROBOTS / LEGGED ROBOTS:** Use bipedal or quadrupedal locomotion to traverse uneven terrain and obstacle-filled environments.

**DRONES/UNMANNED AERIAL VEHICLES:** Unmanned aircrafts that can be remote-controlled, semi-autonomous or fully autonomous.

**AUTONOMOUS UNDERWATER VEHICLES:** Allow for aquatic inspection, maintenance and exploration in ocean environments unsuitable for humans.

**SOCIAL ROBOTS:** Can interact and communicate with people or other machines by following a set of social behaviours and rules.

**EXOSKELETONS:** Physically augment human performance allowing for increased stamina, consistency and/or strength.

**Alphabet CEO planned Hyperloop-like system for bikes:** Google parent Alphabet's CEO Larry Page was reportedly working on a Hyperloop-like system code-named Heliox that would propel bicyclists in a tube system to commute faster. It consisted of a plastic tube, snaked around a circular track, hundreds of feet in the air. It was designed to propel bicyclists at rapid speeds by pumping helium and oxygen into the tube.

**BMW unveils self-driving motorcycle concept:** BMW has unveiled a self-driving bike concept that not only drives on its own but can also start off, lean into turns and deploys the kickstand without human intervention. Based on BMW R 1200 GS bike, the concept is a test bed for improving rider safety. It will help BMW bikes determine if a situation is dangerous in the future.



**Prof. S. Sadagopan**  
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### Science, Technology and Policy

- Justice **Srikrishna Committee** submits its report “**A free and fair digital economy – protecting privacy, empowering Indians**” to Government on July 26, 2018, a landmark development in India’s growth in the digital world
- **ISRO** tests out crew ejection feature on July 5, 2018, in preparation for manned space flights in future; launches **two satellites for UK** on September 16, 2018; **Prime Minister Modi** announces a **manned space mission** by 2022 (75<sup>th</sup> year of Indian Independence) in his Independence Day speech on August 15, 2018; **ISRO chief** talks of December 2021/ January 2022 target; **NASA Sun Mission** (Parker Solar Probe) successfully launched on August 12, 2018 starts a new phase in space exploration; On August 30, 2018 **Uber** selects India as one of the first five countries to try out Air taxi service **Uber Air** (to be a reality in the next five years)
- **Supreme Court** gave **constitutional validity** to **AADHAR** with selective targeted use by Government on September 26, 2018
- The ambitious insurance scheme for 500 million Indians **Modi Care** (Aayushman Bharat) starts on September 23, 2018 with lots of promise
- French engineering firm **Alstom** launches **Hydrogen-powered train** in Europe in September 2018
- Government of India **merges Vijaya Bank** and **Dena Bank** into **Bank of Baroda** on September 17, 2018
- **Rafale deal** (defence deal between India and France) rocks the Nation much of September 2018

### Products

- **Microsoft** announces **Surface Go** in July 2018 to compete with Apple iPad
- **Google** rolls out Android P officially as **Android Pie** on August 6, 2018; re-launches **Tez** as **Google Pay** on August 28, 2018
- **Samsung** launches **Galaxy Note 9** globally in New York on August 9, 2018
- **NPCI** (National Payment Corporation of India) launches **UPI 2.0** on August 16, 2018
- **Nokia** launches **Nokia 6.1 Plus** in the Indian market on August 21, 2018 at a very attractive price point
- **Xiaomi** launches **Poco F1** on August 23, 2018
- **Apple** launches new **iPhone XS & iPhone XS Max** and **Apple Watch 4** on September 12, 2018
- **Amazon** launches a **slew of products** (60+) on September 20, 2018 including many variants of Echo, Microwave oven and even a product for the car – **all powered by Alexa!**

### Markets

- **Apple** creates history; its market capitalization **goes past \$ 1 Trillion** on NASDAQ Exchange at 11:57 AM on August 2, 2018, the first ever for a listed US corporation; **Amazon** follows; **market capitalization touches \$ 1 Trillion** on September 4, 2018
- **Microsoft** stock sky rockets on July 12, 2018 with stock price going past \$ 100 and market capitalization going past \$ 800 Billion, for the first time in history
- **Facebook** sees a **drop of \$ 119 Billion** in market capitalization on July 26, 2018, the largest ever single day drop for any company in the history of stock markets; even worse than **Intel** losing \$ 90 Billion in market value in one day on Sep 22, 2000!
- **Xiaomi IPO** on July 9, 2018 in Hong Kong sees mixed response
- **Broadcom** (semiconductor company) acquiring **CA** (IT infrastructure and security services company) for \$ 18.9 Billion on July 10, 2018 surprised everyone, particularly after its failed attempt to acquire Qualcomm for more than \$ 100 Billion last year

- **French** IT Services major **Atos** acquired **Syntel** (Bharat Desai founded Indian IT Services company founded, with 23,000 people and nearly \$ 1 Billion annual turnover) for \$ 2 Billion on July 23, 2018
- **Cisco** acquired Ann Arbor, Michigan based cloud and device security company **Duo Security** for \$ 2.35 Billion on August 2, 2018
- Indian mid-size IT Services company of the RPG group **Zensar** acquired **IndiGo Slate** (US-based customer experience company founded by Sandy Sharma and Aaron Duggal) for \$ 18 million in July 2018
- **TechMahindra** acquires Czech **Inter Informatics** on August 22, 2018
- **Amazon Pay** buys personal assistant platform **TapZo** (said to be the first India acquisition for Amazon Pay) on August 29, 2018
- **Wal-Mart Labs India** acquires **Appsfly** on September 3, 2018
- US-based **Ebix** acquires Mumbai-based **Miles** for \$ 19 Million on September 3, 2018
- **Infosys** acquires **Fluidio** (Finland-based leader in Salesforce consulting) on September 14, 2018
- **Cognizant** Australia-based **SaaSFocus** on August 23, 2018; buys US-based **ATG** on September 16, 2018
- **Amazon** acquires Birla's retail chain **More** (with more than 500 stores) on September 24, 2018
- **FlipKart** acquires Israel-based start-up **Upstream Commerce** on September 25, 2018
- India's stock market indices **Sensex** touch new peak of 37,000 on July 26, 2018 and 38,989 on August 29, 2018; lots of volatility with crash multiple times in the quarter; finally ending at 36,227 on September 30; so are the global markets; **Oil price** going up and **Rupee falling** to 70 against US Dollar cause macro-economic instability

### Indian IT Companies

- **Top 5 Indian IT companies' headcount goes past a million** as of June 30, 2018 (based on the quarterly results published in August 2018); **TCS** with 400,875; **Infosys** with 209,905; **Wipro** with 164,659; **HCL** with 124,121; and, **TechMahindra** with 113,552!
- **Wipro** creates history by bagging \$ 1.5 Billion order from **Alight Solutions**, the first ever order of more than \$ 1 Billion for Wipro, on September 1, 2018
- **TCS** announces quarterly results for April June 2018 quarter on July 10, 2018, with the **highest growth in 15 quarters**; wins Rs 500 Crores order from **Thomson-Reuters** on September 15, 2018; its **market capitalization** goes past **\$ 8 Lakh Crores** on September 3, 2018; starts conducting online examination for recruitment of 26,502 positions of locomotive pilots' job for Indian Railways on August 9, 2018; the number of applicants is a whopping 47,56,000!
- **HCL** clocks a turnover of \$ 2.05 Billion in April to June 2018 quarter; with this HCL threatens to take India's No 3 position in the Indian IT services industry long occupied by Wipro
- **Infosys** gets \$ 700 Million order from Verizon on September 15, 2018; announces **muted results** on July 13, 2018; announces \$ 750 Crores investment in NOIDA facility with 5,000 seats in July 2018
- **PayTM** goes to Japan thru Japanese PayPay in July 2018
- **FlipKart** launches store for refurbished items **2GUD** in August 22, 2018
- **Ramco** announces partnership with **Microsoft** on cloud-based HR solutions on August 28, 2018; its **aviation suite** gets huge order from USA on September 24, 2018

### Global IT Companies in India

- **Wal-Mart** completes acquisition of **FlipKart** in August 20, 2018
- **Vodafone Idea merger** gets the final approval on August 31, 2018 creating the largest telecom company **Vodafone Idea** in India with more than 400 million customers; September 3, 2018 is the Day 1 of the new entity
- **Uber** announces its **billionth ride in South Asia**; happens to be a ride booked at 1:16 AM of 26<sup>th</sup> July in Bengaluru, the city Uber started India operations, five years back!
- On July 9, 2018, **Samsung** commissions the **world's largest mobile phone assembly plant** with capacity to produce 120 million mobile phones in NOIDA (near Delhi) with Rs 5,000 Crores investment; launches the **largest mobile store** in Bangalore on September 11, 2018
- **Amazon** invests another Rs 2,100 Crores in India operations in August 2018
- The iconic furniture brand **IKEA** opens its **first store** in Hyderabad in August 2018
- **OnePlus** announces its planned R&D Center in India in July 2018
- **Continental** announces its expansion in India in August 2018 with addition of 1,000 more professionals
- **Aruba** (Part of HPE) decides to "Make in India" with local manufacturing of networking gear

### Telecom

- **T-Mobile** places the largest ever **5G order** worth \$ 3.5 Billion on **Nokia** in early August 2018
- **Vodafone Idea** starts operations from August 31, 2018
- Indian government announces **New Telecom Policy** on July 11, 2018; Net Neutrality is upheld

- **BSNL** starts offering **Net Telephony** (reaching any telephone from BSNL App Wings) on July 11, 2018 (said to be the first in India)
- **Reliance Jio** announces the launches of Gigabit fiber service **Jio GigaFiber** from August 15, 2018 to customers in 1,100 towns in India

## People

- The award winners of **Bhatnagar Prize** 2018 announced on September 26, 2018 includes Dr Nitin Saxena (Theoretical Computer Science) of IITK, Dr Ashwin Gumaste (Telecom Networks) of IITB and Dr Amit Kumar (Algorithms) of IITD; **Times World University rankings 2019** announced on September 25, 2018 has **Indian Institute of Science** in the Top 300
- India-born, Australia educated Stanford Professor Dr **Akshay Venkatesh** wins **Fields Medal** (Nobel for Mathematics) given to a maximum of four mathematicians of less than forty years of age) on August 1, 2018
- **South Korea's President** visits India in July and launches Samsung's mobile manufacturing unit in NOIDA, said to be the largest facility in the world
- Chennai-born **Indra Nooyi** announced her decision to step down as **CEO of PepsiCo** on August 12, 2018, after a 12-year stint
- Dr **Satheesh Reddy** takes charge as DRDO Chief on August 25, 2018
- Oracle global products head **Thomas Kurien** who grew up in Bangalore, steps down on September 27, 2018
- 18-year old Hima Das of Assam creates history by winning Gold in the women's 400 M gold at the world's under-20 athletic championship on July 12, 2018, the first ever win in track events for an Indian; Twelve Thai boys and their football coach miraculously rescued by a global team on July 11, 2018 with amazing use of technology (that includes special pumps from Kirloskar in Pune)
- Indian American **Seema Nanda** becomes the **CEO of Democratic National Committee**, the organization that runs one of the two political parties in USA, namely, the Democratic Party, in August 2018
- **Pakistan gets a new elected** Government with cricketer **Imran Khan** as Prime Minister on August 11, 2018
- Former **Prime Minister Atal Bihari Vajpayee** passed away on August 16, 2018; former **Secretary General of the United Nations Kofi Annan** passed away on August 18, 2018
- **ISRO scientist Dr Nambi Narayanan** freed of spying charges by Supreme Court of India on September 17, 2018 ending 25-years of torture

## Education & Research

- On July 9, 2018, Government of India announce the **Institutes of Eminence** list with three in the **Government sector** – **Indian Institute of Science, Bangalore, IIT Delhi** and **IIT Bombay** and three in the Private sector – **BITS Pilani, Manipal Academy of Higher Learning** and the yet to be established **Jio University**

## Start-up scene

- With \$ 800 Million funding on September 26, 2018 funding from SoftBank, India-based hotel-room aggregator **Oyo** is worth **\$ 5 Billion!**
- IIT-Delhi incubated logistics focused Robotics company **GreyOrange** starts US operations in August 2018
- Bangalore-based Taxi aggregator **Ola** starts **UK operation** in August 2018
- **Wal-Mart Labs India** acquires **Appsfly** on September 3, 2018
- **Routematic** (App-based office commute service) grows its Bangalore operation in September 2018
- **UiPath** (RPA vendor) gets \$ 225 Million funding in September 2018
- Engineering major **Greaves** acquires Hemalatha Annamalai founded Coimbatore-based electrical 2-wheeler manufacturer **Ampere** on August 31, 2018

## Infrastructure

- **Sikkim** gets its **Airport** on September 25, 2018; the 100<sup>th</sup> commercial Airport in India brings air connectivity to ALL the States of India
- Indian Railways & Google partnership takes free Wi-Fi to more nearly 400 Railway stations; through another partnership, **Google** chronicles the 150 years history through "**Indian Railways – lifeline of a Nation**", Rail Heritage project on September 29, 2018

## General

- **India** becomes the **6<sup>th</sup> global economy** as per IMF, based on 2017 GDP of \$ 2.59 Trillion (USA with 19.4 T, China with 12.2 T, Japan with 4.87 T, Germany with \$ 3.67 T and UK with \$ 2.62 T are ahead). France with \$ 2.58 B is the 7<sup>th</sup>; Brazil (8<sup>th</sup>), Italy (9<sup>th</sup>) and Canada (10<sup>th</sup>) are the other Top Ten economies of the world

- **GST** completes one year on July 1, 2018, with more benefits and less problems, so far
- **Tata steel is 150 years old** in September 2018
- **India Post Payment Bank** becomes operational on September 1, 2018
- Viral **WhatsApp message** destroys **Infibeam**'s market value by 70% on a single day on September 28, 2018
- **All India Radio** is available **Alexa** in **14 Indian languages** from September 29, 2018
- **Indonesian Tsunami** kills nearly 800 people in September 2018; **Floods in Kerala** causes havoc in August 2018 with significant loss of lives and property

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Professor Sowmyanarayanan Sadagopan ([ss@iiitb.ac.in](mailto:ss@iiitb.ac.in)) is the Director of IIIT-Bangalore. These are his personal views. He has been writing on "What's Hot in IT" from an Indian perspective continuously from 1997; Times of India, Financial Express, IT Magazine carried the monthly (and yearly columns) till 2016; IEEE India has been carrying the quarterly columns since 2017

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### Points to Ponder

Anybody who is too much stressed or confused should read this again and again.....I got all my answers. Try this.

A rare conversation between Krishna & Today's Arjun. Read it aloud to family, it's one of the best message I have come across...

Arjun: I can't find free time. Life has become hectic.

Krishna: Activity gets you busy. But productivity gets you free.

Arjun: Why has life become complicated now?

Krishna: Stop analyzing life... It makes it complicated. Just live it.

Arjun: Why are we then constantly unhappy?

Krishna: Worrying has become your habit. That's why you are not happy.

Arjun: Why do good people always suffer?

Krishna: Diamond cannot be polished without friction. Gold cannot be purified without fire. Good people go through trials, but don't suffer. With that experience their life becomes better, not bitter.

Arjun: You mean to say such experience is useful?

Krishna: Yes. In every term, Experience is a hard teacher. It gives the test first and the lessons later.

Arjun: Because of so many problems, we don't know where we are heading...

Krishna: If you look outside you will not know where you are heading. Look inside. Eyes provide sight. Heart provides the way.

Arjun: Does failure hurt more than moving in the right direction?

Krishna: Success is a measure as decided by others. Satisfaction is a measure as decided by you.

Arjun: In tough times, how do you stay motivated?

Krishna: Always look at how far you have come rather than how far you have to go. Always count your blessing, not what you are missing.

Arjun: What surprises you about people?

Krishna: When they suffer they ask, "why me?" When they prosper, they never ask "Why me?"

Arjun: How can I get the best out of life?

Krishna Face your past without regret. Handle your present with confidence. Prepare for the future without fear.

Arjun: One last question. Sometimes I feel my prayers are not answered.

Krishna There are no unanswered prayers. Keep the faith and drop the fear. Life is a mystery to solve, not a problem to resolve. Trust me. Life is wonderful if you know how to live.

Stay blessed and Stay Happy Always.....!!!



## Information Resources



*Compiled by*

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### **From AT&T To Xerox: 73 Corporate Innovation Labs**

Innovation is critical for established companies to stay relevant in the face of disruption. Here's our list of corporate innovation labs.

Corporate innovation is critical for established companies looking to stay relevant in the face of disruption from up-and-coming start-ups. With industries being unbundled left and right (supermarkets, banking, cars — just to name a few) more companies are opening up in-house innovation labs every day.

Sometimes corporate innovation goes wrong, and we've written about corporate innovation theater before. Now here's our list of innovation labs, both newly formed and well established, working to turn new ideas into new opportunities at long-lived companies.

Know these innovation labs at <https://goo.gl/E64btP>

### **Quantum computing 101**

Although quantum information has been around for a long time, we're starting to see more about it in the media. We hope to give you a quick start guide on:

- What is quantum computing?
- Superposition and entanglement
- Why do quantum effects matter?
- What can a quantum computer do that a classical computer can't?
- But I don't want to factor very large numbers
- A quantum computer can hack into my private data?
- How can quantum mechanics create ultra-secret keys?
- What else can we do with quantum mechanics?
- Where can I get a quantum computer?
- What is required to build a quantum computer?
- When will there be a real quantum computer?
- Is quantum technology still years away?

Read the full story at <https://goo.gl/2o74Xi>

### **Huge List of 65 Computer and IT Certifications**

Becoming IT certified in a specific skill or product is a way to prove that you have the necessary knowledge to perform a job in a given field or a job that uses specific technologies. Earning certification is a good way for computer science graduates and entry-level IT professionals to improve their resume. Employers often look at a candidate's computer and technology certifications in order to assess whether or not the individual is a viable candidate for a position. From Official Microsoft certifications to cyber security and Linux exams, Webopedia compiled this alphabetical list of different certifications related to computer technologies with a brief explanation of each certification and links to help interested learners find additional information.

Know them at <https://goo.gl/q25YTX>

## How India can be a \$10 trillion economy by 2030

“Tech entrepreneurship will drive India’s growth. Today, India is ready to be one of the top five economies in the world. We already are in the top three in PPP (Purchasing Power Parity), but in terms of the current value of GDP we will be top five at 2030,” said Mohandas Pai, Founder, Aarin Capital, at NSE Tech Conclave, which was organised by the National Stock Exchange (NSE), in association with YourStory,

Pai said India today is poised to become a \$10 trillion economy by 2030. Backing his statement, Pai pointed out different ways in which India is positioned in the growth trajectory. The factors that will make India a \$10 trillion economy, he says, are:

Read the post at <https://goo.gl/ATpj26>

Related presentation : India @ 2030 – How Tech Entrepreneurship Will Create A \$10 Trillion Economy at <https://goo.gl/fcTsH>

## 10 Amazing Leadership Lessons From Design Thinking

Leadership is a challenging proposition in a world of disruptions and changes due to the rate of change being overwhelming. How do leaders cope with constant changes, enormous expectations and an unpredictable future? Well, a lot of the top organisations including Pepsi, Nike, Apple and Google use Design Thinking for leadership matters.

Design thinking is coming up with visual patterns that lead to the desired solutions. In other words, it is about connecting the dots to come up with solutions to practical problems that you want to solve. The Design thinking approach is widely appreciated and adopted by leaders around the globe.

Below, we look at 10 intriguing leadership lessons from design thinking:

Full post at <https://goo.gl/gX3NYD>

## Open Source Artificial Intelligence: 50 Top Projects

Since the earliest days of computers, creating machines that could "think" like humans has been a key goal for researchers. In the past few years, computer scientists have made huge leaps forward in artificial intelligence (AI), to the point where the technology is becoming commonplace.

In fact, Gartner predicts, "By 2020, AI technologies will be virtually pervasive in almost every new software product and service." And IDC forecasts that companies will spend \$12.5 billion on AI technology in 2017, 59.3 percent more than in 2016. That tremendous growth is likely to continue through 2020, when revenues could top \$46 billion.

Open source software development has played a huge role in the rise of artificial intelligence, and many of the top machine learning, deep learning, neural network and other AI software is available under open source licenses.

For this list, we selected 50 of the most well-known of these open source artificial intelligence projects. They are organized into categories and then alphabetized within those categories. The lines between some of the categories can be fuzzy, so we used the project owners' descriptions of their applications to determine where to place the various tools.

Know these projects at <https://goo.gl/W79L1N>

## 24 Underwater Drones – The Boom in Robotics Beneath the Waves

Robotics Beneath the Waves

Aerial drones have buzzed their way into almost every aspect of the modern world, from photography and television news coverage, to environmental monitoring and archaeology.

And many of the concepts developed for aerial drones are being adopted and adapted to work in a very different environment — underwater.

Look at the many ways that drones are being used beneath the waves, by oceanographic scientists, archaeologists, militaries, commercial divers, photographers and undersea explorers.

Slideshow at <https://goo.gl/PiFThN>

## **Octane: Develop your employability skills**

As well as your technical and academic skills, there are other skills that any employer looks for when deciding who they want to work with, be they academic researchers, government, business, non-governmental organisations, public or private sector. While there are many lists of these 'employability' skills, at Oxford we focus on the key eight skills – based on the Confederation of British Industry (CBI)'s report, Future fit: Preparing graduates for the world of work. We call this the Octane framework.

Download the report from <https://goo.gl/vxNNYD>

## **10 TED talks to sharpen your communication skills**

Do you feel like when you talk, no one listens? Or do you struggle to remember what you hear? Improve your speaking and listening skills with these talks

Effective communication is paramount to great leadership. But it's more nuanced and complicated than just learning how to give a great speech. If you want to inspire others through your words, you must learn how to not only speak effectively, but also listen effectively. Communication is a two-way street, after all.

We've rounded up 10 TED Talks that offer wisdom and advice for leaders who are serious about improving their communication skills. From practical tips like leaving bullet points out of slides, to learning the importance of vulnerability in conversations, these talks offer a mini-course on more effective communication. That should lead to deeper understanding on both sides for leaders and teams.

Full post at <https://goo.gl/fFTRGg>

## **Here are the Top Online Scams You Need to Avoid Today**

We truly want to believe that the Internet is a safe place where you can't fall for all types of online scams, but it's always good reminder to do a "reality check". We, humans, can become an easy target for malicious actors who want to steal our most valuable personal data.

Criminal minds can reach these days further than before, into our private lives, our homes and work offices. And there is little we can do about it. Attack tactics and tools vary from traditional attack vectors, which use malicious software and vulnerabilities present in almost all the programs and apps (even in the popular Windows operating systems), to ingenious phishing scams deployed from unexpected regions of the world, where justice can't easily reach out to catch the eventual perpetrators.

Use the links in the post to quickly navigate the list of online scams and see the top online scams you need to stay away from right now.

Full post at <https://goo.gl/2L6EVn>

## **33 Industries Other Than Auto That Driverless Cars Could Turn Upside Down**

Fast food, real estate, military operations, even home improvement — many large industries will have to shift their strategies in the wake of driverless cars.

It's all but a certainty that autonomous or driverless vehicles will be widely used in the United States at some point over the next two decades.

Already, over two dozen major corporates including Google, Apple, and Mercedes Benz are hard at work building their own self-driving vehicles. Tesla's Model S includes an autopilot mode which gives it semi-autonomous capabilities.

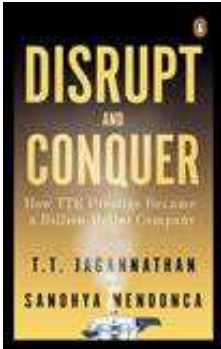
Clearly, tech and auto companies stand to gain, but many other industries could face serious upheavals unless they are able to adapt to the many changes self-driving cars will bring to the market.

Below, we dive into 33 industries, from the obvious (professional driving & trucking) to the more surprising (fitness?), that will be shaken up by the advent of autonomous vehicles.

Full story at <https://goo.gl/LB4Bzh>

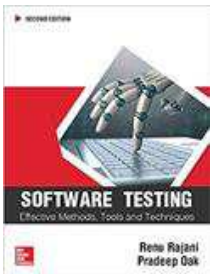
More resources from the "Interesting Reads" blog post archives at <https://goo.gl/VGXizd>

## Books



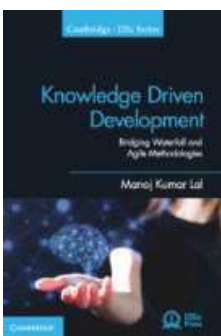
**Disrupt and Conquer: How TTK Prestige Became a Billion-Dollar Business.** Authors: T T K Jagannathan and Sandhya Mendonca. Publisher: Portfolio. Sold by: Random House India. Hardcover. Pages: 232. Price INR 599 (INR 469 at Amazon).

The TTK Group was founded in 1928 in Chennai (then Madras) by T.T. Krishnamachari, who later became a Union minister and held the portfolios of finance, industry and commerce for close to fifteen years. In this book, the current chairman T.T. Jagannathan, along with Sandhya Mendonca, takes the readers through the journey of this extraordinary company which fought off bankruptcy and rose like a phoenix to become a highly profitable, successful entity. What makes this story all the more startling is that T.T. Jagannathan is an accidental and reluctant businessman. He came into the profession very unexpectedly, and without any preparation, with neither an MBA nor having ever worked in the family business before having its very survival entrusted to him. Like a phoenix, the Group and its constituent companies, have risen from the ashes, many times over, to stand tall and proud. This is the story of a journey that began with early success and experienced catastrophic disasters, and set about turning its fortunes around in stunning comebacks, time and again. With invaluable business lessons, decades of experience and innovation distilled in these pages, Disrupt and Conquer is a must-read for aspiring entrepreneurs, executives and business leaders. We are happy to inform the author and the publisher have given permission to publish the chapter 17 -- “The Karma of Business”, of this book.



**Software Testing: Effective Methods, Tools and Techniques.** 2<sup>nd</sup> Edition. Authors: Renu Rajani & Pradeep Oak. Publisher: McGraw Hill Education. Paperback. Pages: 376. Price: INR 635 (INR 425 at Amazon).

The book is based on the authors’ experience in setting up, leading, and transforming test engagements and introducing testing in emerging technology engagements. Since the first edition of this book in 2003, which saw 13 reprints to date, the software testing discipline has evolved with its broadened and deepened reach. This thoroughly revised book presents these developments in a comprehensive manner with a strong balance of theory, analysis and design. Along with its well-defined learning objectives and chapter-end exercises, the book motivates readers to delve deeper into the application aspect of the subject. The book explores the different aspects of testing dealing with (i) Testing tools, (ii) Latest testing methods for Agile, DevOps, Object Oriented development, (iii) Testing of Social Media, Mobility, Analytics, and Cloud applications (iv) Case studies involving latest and niche topics (v) Current state of practice and opportunities & careers in testing. The key features include: 15 Projects on key topics like-Software Test Design Technique, Testing Analytics and Big Data Applications, Model-based Testing etc. ; A separate section on Current State of Practice based on the industry’s requirements; 5 Case studies on topics like Embedded Software Systems used in Aerospace Applications, Validation of BASEL II Compliance, etc.; Exhaustive review question in every chapter; Well-defined challenges encountered during application. Supplements include: Instructor’s Elements:-- PowerPoint Lecture Slides; and Student’s Elements -- Web Links for further reading & Test Case Scenarios for Practice. The book will be useful to graduates specializing to make a career in software testing and IT professionals aiming to work in software testing engagements.



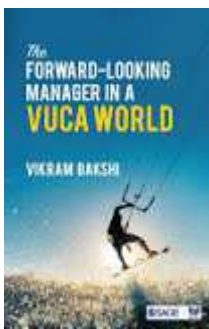
**Knowledge Driven Development – Bridging Waterfall and Agile Methodologies.** Author: Manoj Kumar Lal, a BIT Sindri and IISc Bangalore alumnus and working in TCS since 1997. Publisher: Cambridge University Press and IISc Press. Hardcover. Pages: 322. Price: INR 750/-.

This book introduces a new software development methodology – Knowledge Driven Development (KDD) based on digitisation of the project knowledge. The project knowledge needs to be consistently managed across the project’s activities and outputs and any deviation may result in project delivery issues. The two well-known methodologies - Waterfall and Agile, attempt to meet this challenge although with limited effectiveness. Waterfall projects struggle to keep their documentation up-to-date and in Agile the project knowledge specified is generally at a high level. The project knowledge is digitised in KDD via a specified number of building blocks represented in the inventory and relationship format. Digitisation allows quantification of project knowledge resulting in easier impact analysis, exhaustive traceability, easier reuse, less rework and easier defect detectability. KDD provides a continuous improvement environment in the project delivery by reusing and adding to the enterprise knowledge. KDD supplements DevOps with its digital knowledge management offering. KDD may evolve as a constituent of Industry 4.0 proposition from knowledge management perspective. KDD may also assist Waterfall and Agile methodologies via its digital knowledge management proposition. Taking the knowledge digitisation concept beyond IT, the book proposes the Generic Knowledge Management Framework (GKMF). With a brief introduction to KDD, the author has contrasted Waterfall, Agile and KDD methodologies through an example in the first chapter. Via 17 chapters of the book, the author has provided the full conceptual details of KDD and GKMF to be assessed by its interested readers in industry and academia. This book adds to the existing literature on software engineering and knowledge management.



**Software Wasteland: How the Application-Centric Mindset is Hobbling our Enterprises.** Author: Dave McComb. Publisher: Technics Publications. Paperback. Pages: 220. Price: INR 1745 at Amazon. USD 24.95.

This is the book your Systems Integrator and your Application Software vendor don't want you to read. Enterprise IT (Information Technology) is a \$3.8 trillion per year industry worldwide. Most of it is waste. We've grown used to projects costing tens of millions or even billions of dollars, and routinely running over budget and schedule many times over. These overages in both time and money are almost all wasted resources. However, the waste is hard to see, after being so marbled through all the products, processes, and guiding principles. That is what this book is about. We must see, understand, and agree about the problem before we can take coordinated action to address it. The trajectory of this book is as follows: Chapter 1 explores how bad the current state is. The three industries that address software waste are discussed, including the legacy software industry, neo-legacy software industry, and legacy modernization industry. Examples of application waste are illustrated from both public and private sectors. Chapter 2 deals with the economics of the software industry. Although the economic trade-offs are changing at the speed of Moore's Law, our approaches are not keeping pace. One can learn how information systems really behave in terms of actual application development. In Chapter 3, the author uses "root cause analysis" to reveal the real contributors to this situation, which are dependency, redundancy, complexity, and application centrality. Chapter 4 recounts the many failed attempts we've made in the past to deal with information system complexity, including relational databases, ERP systems, enterprise data modeling, service oriented architectures, and APIs, Agile, data warehouse and business intelligence, outsourcing and offshoring, cloud, Software as a Service (SaaS), data lakes, machine learning, and artificial intelligence. Chapter 5 dismantles seven fallacies that contribute to our remaining stuck. For example, the first fallacy is "We need detailed requirements or we won't get what we want." The quagmire is not affecting all sectors of the economy equally. Chapter 6 looks at how this is playing out in the government and private sectors, large and small companies, and various parts of the IT industry itself. Chapter 7 outlines some action you can take now to begin to extricate yourself, including a detailed assessment and defining metrics for measuring and preventing software development waste.



**The Forward-Looking Manager in a VUCA World.** Author: Vikram Bakshi. Publisher: SAGE Publications Pvt. Ltd. Paperback. Pages: 312. Price: INR 450 (INR 336 at Amazon)

Many large organizations have to cede their market dominance to new disruptive players. Well-oiled organizations are hitting roadblocks due to unanticipated problems that are slowing down operations. VUCA (Volatile, Uncertain, Complex and Ambiguous) is affecting organizations like never before - impacting schedules, delaying deliverables, and causing cost overruns. Managing projects has become a nightmare with the uncertainties and ambiguities of business, delaying integration of allied activities, making the project a non-starter even before it gets off the ground. In this VUCA world, it is imperative to confront the volatile, embrace the unknown, conquer the complex, and understand the ambiguous to be able to predict what lies ahead. This book helps managers master the art of dealing with VUCA by providing relatable experiences from the armed forces and advocating the use of RACE methodology. The book suggests disruptive tools and methods, and advises managers on the leadership traits needed for successfully completing projects by cutting losses and preventing chaos. It is a must-read for all managers involved in operations, supply chain, logistics, and production and manufacturing portfolios. Ex-army personnel who are starting a second career in the corporate/private sector will also greatly benefit from reading this book.



**Evolving Innovation Ecosystems: A Guide to Open Idea Transformation in the Age of Future Tech.** Author: Carol L. Stimmel. Publisher: Auerbach Publications. Hardcover. Pages: 268. Price: USD 62.69

While emerging technologies create massive opportunity, especially for investors and companies that seek more adaptable forms of economic growth than currently available, value is held inert by traditional approaches, patents, and other closed systems. Yet, open data, content, and information may be the key to mass innovation for future technologies, although they bring difficult challenges to private-industry models that depend on the established ideas of intellectual property. It is from this foundational observation that OpenXFORM (a blending of the words Open and the engineering abbreviation for Transformation) was developed and is explored and described in this book. The intent of the model design is to synthesize an approach to the process of innovation, inspired by natural systems and human-centric design processes. OpenXFORM describes how an open system of innovation can adapt to the unregulated world of information, data, and content; can decompose its own information to release to the open world; and can discover ways to find the points of synergy among the studied and tested methodologies that put human relationships first. This book presents an explicit innovation process that shows how to move from a breakthrough idea through a process that encourages innovative thinkers to test their assumptions, validate hypotheses, and tune and tweak their ideas, not only to drive solutions for users but also to meet the strategic goals of their companies. The anatomy of innovation through OpenXFORM contains the process for moving ideas from a flight of fancy to an explicit concept that is ready to produce.

## Embracing the Next Billion Users of the Internet

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### Challenges for the next billion users?

The next billion Internet users are likely to be non-English speakers.

Even though website content can now be in a local, non-English language and script, domain names have traditionally consisted of letters a-to-z, digits 0-to-9 and hyphen. This can become an obstacle for speakers of different languages and scripts to access the content.

The Internationalized Domain Names in Applications (IDNA) 2003 standard was devised by the Internet Engineering Task Force (revised to [IDNA2008](#)) to enable domain names in different languages and scripts that are supported by the [Unicode](#) standard. Domain name consists of labels at multiple levels separated by dots. Though the IDNA standard allowed for labels to be represented in multiple scripts, it was only in 2009 that the top-level domain (TLDs) labels, such as “com”, “org”, “in”, “sg”, etc., were allowed for delegation in local languages and scripts for country code TLDs (ccTLDs). In 2013, this was allowed for generic TLDs (gTLDs).

During the applications of IDN ccTLDs and IDN gTLDs, the Internet community identified cases in which different labels may be considered “same” or indistinguishable by the end-users. For example, labels in Chinese can be written in two different ways – using the Traditional Chinese or the Simplified Chinese characters. This is called variant forms. Similarly, some words in Latin script can be written in exactly the same visual form using the Cyrillic script. Unless such variant labels are identified and managed, they can pose usability and security challenges subsequently, e.g., pose a significant phishing potential.

#### ⊙ Example of within-script variant labels (Arabic script)

شبكة (06C3 06A9 0628 0634)  
شبكة (0629 06A9 0628 0634)  
شبكة (0629 0643 0628 0634)

#### ⊙ Example of within-script variant labels (Simplified Chinese and Traditional Chinese)

名称 (540D 79F0)  
名稱 (540D 7A31)

#### ⊙ Example of cross-script variant label (Latin script and Cyrillic script)

epic (0065 0070 0069 0063)  
epic (0435 0440 0456 0441)

#### ⊙ Example of cross-script variant label (Telugu script and Kannada script)

గళము (0C17 0C33 0C2E 0C41)  
ಗಳಮು (0C97 0CB3 0CAE 0CC1)

Figure 1: Sample of variant labels, the visual forms and their Unicode code points.

### Solution for enabling multilingual domain names

In 2010, the Internet Corporation for Assigned Names and Numbers (ICANN) community identified that in the Domain Name System (DNS) environment, there is no accepted definition for what may constitute a variant relationship between top-level labels. Subsequently, a Root Zone Label Generation Rules (RZ-LGR) Procedure<sup>1</sup> was developed to determine valid domain names and their variant labels for a particular script. Based on this Procedure, LGR for each script is defined by the relevant script-community panel called a Generation Panel (GP).

Currently there are 28 scripts to be supported at the top-level of the DNS, of which 15 scripts have completed their RZ-LGR proposals<sup>2</sup> for further review and integration. Many more GPs are working towards finalizing their work<sup>3</sup>.

The solution for a particular script consists of three analyses. It should contain:

- The characters valid for use in the DNS,
- The variant rules for each character and
- The additional constraints on the entire label which are crucial for defining well-formed labels for complex scripts and managing the number of usable variant labels.

Each GP needs to carefully evaluate the possibilities and propose a conservative solution to address the usability and security considerations.

### Neo-Brahmi Generation Panel

In this context, in 2015, the Neo-Brahmi Generation Panel (NBGP) was formed to develop such rules for nine scripts used in South Asia, including Bangla, Devanagari, Gujarati, Gurmukhi, Kannada, Malayalam, Oriya, Tamil and Telugu. The NBGP members comprise of more than 60 experts in technology and linguistics from Bangladesh, India, Nepal, Singapore and Sri Lanka. The NBGP has already finalized the proposals for many of these scripts, which are currently undergoing public review (see [www.icann.org/idn](http://www.icann.org/idn)) and aims to finish its work in the coming months.

### The envisioned future

With the support of different communities across the globe, ICANN helps to define and document the rules to determine valid domain name labels for the top-level and identify their variant labels. This allows complete domain names, including top-level domains, to be available to communities in their own languages and scripts in a secure and stable manner, promoting better accessibility of domain names across the world.

### References

- 1 <https://www.icann.org/en/system/files/files/lgr-procedure-20mar13-en.pdf>
- 2 <https://www.icann.org/resources/pages/lgr-proposals-2015-12-01-en>
- 3 <https://www.icann.org/resources/pages/generation-panel-2015-06-21-en>



**About the author:** Pitinan Kooarmornpatana is a Computer Engineer professional. Pitinan joined ICANN in August 2017 as an Internationalized Domain Name (IDN) Programs Manager. She is currently focused on facilitating various Script Generation Panels to develop the Label Generation Rules proposals for the root zone.

## ICT as applied to social protection

Information and Communications Technology (ICT), as applied to social protection, falls into five broad categories:

- **Technical or incremental.** Automating or replacing manual routines and paperwork with digital technologies, such as the use of stand-alone computers.
- **Sustained.** Bringing about long-term organizational and administrative improvements in efficiency, accuracy, and targeting, such as the use of databases and analytical software programs.
- **Disruptive.** Fundamental restructuring of the way that programs are organized, often involving an internal shift of ownership of projects, which could, for instance, result in the merging of government agencies. The integration of databases may be part of this process.
- **Radical.** Providing greater stakeholder influence through web-based information systems, and the involvement of nongovernment organizations or community associations.
- **Transformative.** Facilitating a wholesale change in the approach toward social protection, such as web-based systems of self-declaration and assessment. Modern taxation systems often move in this direction.

# INO: A National Mega Science and Engineering Project

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## Abstract:

The India-based Neutrino Observatory (INO) is a multi-institutional project aimed at building a world-class underground laboratory at the Bodi West Hills near Madurai in Tamil Nadu. The collaboration is deeply engaged in design and construction of a mega science experiment called Iron Calorimeter (ICAL) for studying many key open questions involving the elusive particles called neutrinos. The magnetised ICAL will consist of more than 50,000 tons of iron plates arranged in stacks with gaps in between where around 30,000 Resistive Plate Chambers (RPCs) would be inserted as active detectors. A total of about 3.6 million ultra-high speed detector signals need to be instrumented in this detector.

A conscious and consistent effort at developing local components and solutions for all the engineering aspects has been undertaken. A large scale detector R&D effort was undertaken to design, develop, characterise and produce RPCs of  $2\text{m} \times 2\text{m}$  in size successfully. Generations of gas systems, including a closed-loop unit were developed and built. The electronics comprising of indigenously developed custom ASICs and high end FPGAs as well as programmable trigger and high speed data acquisition systems are in the advanced stages of development, production and deployment.

## Introduction

Important developments have occurred recently in neutrino physics and neutrino astronomy. Oscillations of neutrinos, and the inferred evidence that neutrinos have mass, are likely to have far-reaching consequences. Indian scientists were pioneers in atmospheric neutrino experiments.

In fact, neutrinos produced by cosmic ray interactions in the earth's atmosphere were first detected in the deep mines of the Kolar Gold Fields (KGF) in south India in 1965. In order to revive underground neutrino experiments in India, a multi-institutional collaboration has been formed with the objective of creating an India-based Neutrino Observatory (INO). Considering the physics possibilities and given the past experience at KGF, the INO collaboration has decided to build a magnetised Iron CALorimeter (ICAL) detector with Resistive Plate Chambers (RPCs) as the active detector elements (Figure 1).

In the first phase of its operation, ICAL will be used for atmospheric neutrino physics with the aim of making precision measurements of the parameters related to neutrino oscillations. The detector will be magnetised to a field of about 1.3T, enabling it to distinguish the positive and negative muons and thus identifying muon-type neutrino and anti-neutrino produced events separately. This will be useful for ICAL to provide an exciting possibility to determine the ordering of the neutrino mass levels. Good tracking, energy and time resolutions as well as charge identification of the detecting particles are the essential capabilities of this detector. The ICAL experiment will need about 30,000 RPCs each of about  $2\text{m} \times 2\text{m}$  in area.

### 1. Resistive Plate Chambers (RPCs)

An RPC is a particle detector utilising a constant and uniform electric field produced by two parallel electrode plates, at least one of which is made of a material with high bulk resistivity. A gas mixture with a high absorption coefficient for ultraviolet light is flown through the gap between the electrodes. When the gas is ionised by a charged particle crossing the chamber, free charge carriers that are deposited in the gas gap trigger avalanches of electrons in the externally applied electric field and originate a discharge. Due to the high resistivity of the electrodes, the electric field is suddenly dropped down in a limited area around the point where the discharge occurred. Thus the discharge is prevented from propagating through the whole gas volume. The sensitivity of the counter remains unaffected outside this small area. On the other hand, due to the ultra-violet absorbing component of the gas mixture, the photons produced by the discharge are not allowed to propagate in the gas. This prevents secondary discharges from originating at other points of the detector. The propagation of the growing number of electrons induces a current on external strip electrodes.



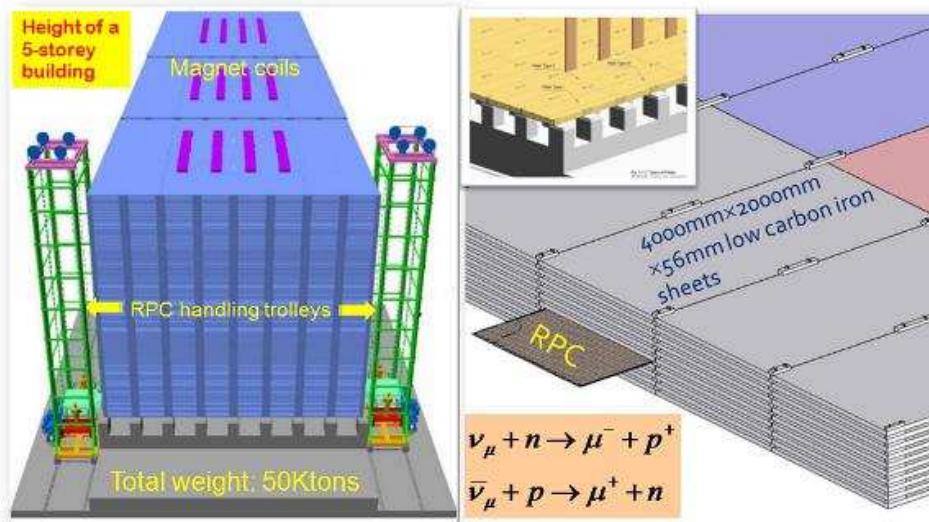


Figure 1: Particles produced in the neutrino interactions pass through alternating layers of iron plates and RPCs, leaving tracks in the latter. Tracks bend as per the charge of the produced particles, due to the ICAL's magnetic field. ICAL will be world's largest electromagnet.

## 2. Basic principle of operation of RPC

The RPC detector in its simplest configuration is shown in Figure 2. Two planar electrodes made out of a resistive material (typically glass or bakelite) having bulk resistivity of  $10^{10} - 10^{12} \Omega\text{-cm}$  are spaced by a few mm. The electrodes are connected to a high voltage power supply in order to create a uniform and intense electric field (about 5 kV/mm) in the gap between them. A thin layer of graphite is coated over the external surface of the electrodes to permit uniform application of the high voltage. The electrodes are kept apart by means of small polycarbonate cylindrical spacers having a diameter of 11mm and a bulk resistivity greater than  $10^{13} \Omega\text{-cm}$ . A gas mixture could consist of Argon, Isobutane and an electronegative gas like Freon (R134a). Argon acts as target for ionising particles while Isobutane, being an organic gas, helps to absorb the photons that result from recombination processes thus limiting the formation of secondary avalanches far from the primary ones. An electronegative gas may serve the purpose of limiting the amount of free charge in the gas. This type of gas mixture is particularly important when one wants to avoid the onset of streamers. The surface resistivity of the graphite coating is high enough to render it *transparent* to the electric pulses generated by the charge displacement in the gas gap. For this reason electric signals can be induced on metallic strips capacitively coupled to the gap. The strips are mounted on the external surface of the gap from which they are separated by a layer of mylar insulator. Two different sets of strips oriented in orthogonal directions may be arranged on both sides of the detector to obtain measurements in both planes. The strips behave like transmission lines with typical characteristic impedance of about 50 $\Omega$ .

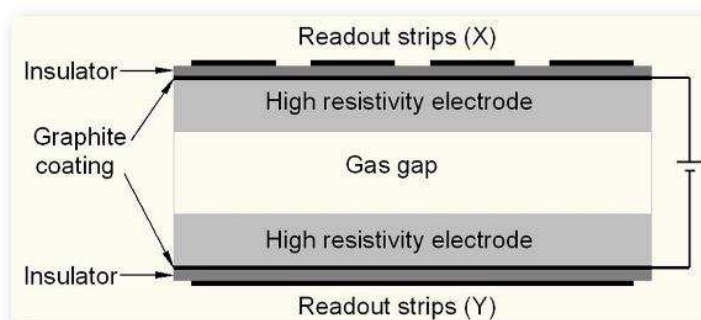


Figure 2: Constructional schematic of a basic Resistive Plate Chamber

High resistivity of the electrodes prevents high voltage supply from providing the electric charge that would be necessary to maintain the discharge between the electrodes. Therefore the electric field drops drastically in the region of the discharge causing it to extinguish.

### 3. Large area RPC development and characterisation

Having learnt the science and technology of RPC design through fabrication and characterisation of small prototype chambers, we have taken the next logical step to develop larger area RPCs of  $1\text{ m} \times 1\text{ m}$  in dimensions. We used 3 mm thick float glass sheets which were procured locally. The glass sheets were coated with the special paint that we had developed and applied using the automatic plant. The polycarbonate spacers, buttons and gas nozzles were used for the assembly of the gas gap, which was set in place by using the vacuum jig. Machined plastic honeycomb panels mounted orthogonally on either side of the gas gap, were used for signal pickup. Finally the chamber was packed inside a case made of aluminum honeycomb panels. We have built 12 chambers of this type and individually characterised them in a cosmic ray test stand. These chambers were arranged in a detector stack and is in continuous operation now for several years tracking cosmic ray muons (Figure 3).



Figure 3: RPC test stands built at various INO labs and being operated round the clock for several years

### 4. Development of RPCs for ICAL detector

The ICAL detector proposes to use about 30,000 RPCs of  $2\text{ m} \times 2\text{ m}$  in dimensions. Therefore, our final aim was to build RPCs of this size and study their performance and long-term stability in operation, so that they can be successfully produced in large numbers and used in the ICAL detector. These RPCs are comparable to some of the largest area chambers in the world. We essentially followed the same procedure which we have streamlined for the fabrication of gas gaps earlier. However, RPCs of this large area had required design of and development of special handling system and jigs for their assembly and handling. We have successfully designed and developed this infrastructure. Now large number of  $2\text{ m} \times 2\text{ m}$  RPCs are being produced in many Indian industries.

### 5. Closed loop gas system

Pilot unit of a closed loop gas mixing and distribution system (schematic of which is shown in Figure 4) for the INO project was designed and is being operated with  $2\text{ m} \times 2\text{ m}$  RPCs for many years. A number of studies on controlling the flow and optimisation of the gas mixture through the RPC stack were carried out. The gas system essentially measures and attempts to maintain absolute pressure inside the RPC gas volume. During typical Mumbai monsoon seasons, the barometric pressure changes rather rapidly, due to which the gas system fails to maintain the set differential pressure between the

ambience and the RPC gas volume. As the safety bubblers on the RPC gas input lines are set to work on fixed pressure differentials, the ambient pressure changes lead to either venting out and thus wasting gas through safety bubblers or overpressuring the RPC's gas volume and thus degrading its performance. The above problem also leads to gas mixture contamination through minute leaks in gas gap. The problem stated above was solved by including the ambient barometric pressure as an input parameter in the closed loop. Using this, it is now possible to maintain any set differential pressure between the ambience and RPC gas volumes between 0 to 20mm of water column, thus always ensuring a positive pressure inside the RPC gas volume with respect to the ambience. This has resulted in improved performance of the gas system by maintaining the constant gas flow and reducing the gas topping up frequency.

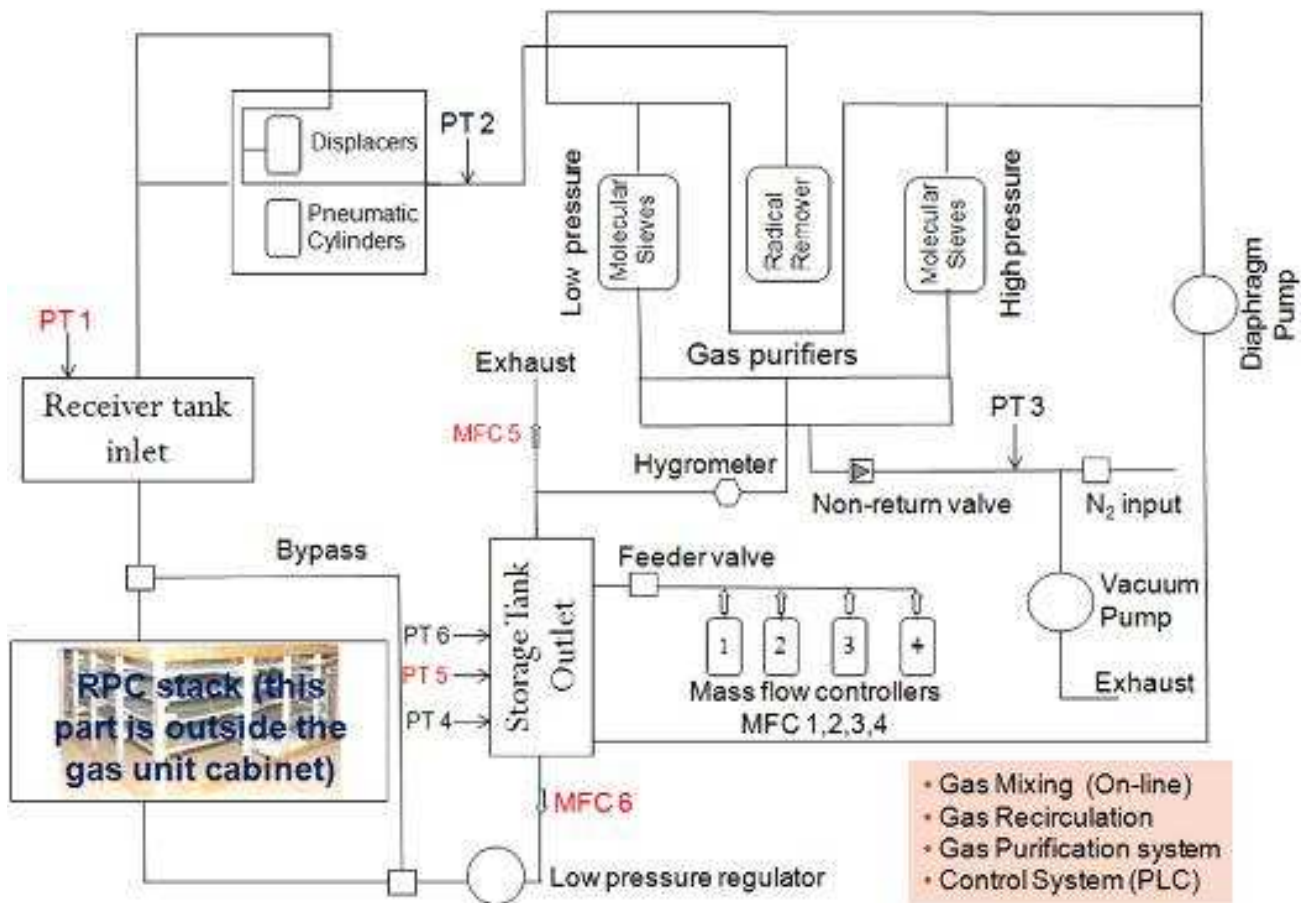


Figure 4: Schematic flow diagram of Closed loop gas system for operating RPC detector stacks

## 6. ICAL electronics

The ICAL DAQ system performs a large variety of tasks. It identifies physics events in the detector by forming a trigger, tracks the muons formed from the neutrino interactions with iron by storing the detector state during an event and find directionality of neutrinos through tracking and timing. It also monitors health of the RPC detectors by recording their noise rates and chamber currents periodically. Architecture of the ICAL's electronics and DAQ systems (Figure 5) is based on designating the RPC as the minimum standalone unit. Analog front-end (AFE) boards using indigenously designed 4-channel voltage amplifier and 8-channel leading edge discriminator ASICs, are mounted on two orthogonal edges of the RPC unit. The digital front-end (DFE) module is located at one corner of the RPC unit. DFE module comprises of several functional blocks such as an ASIC based Time-to-Digital Converter (TDC), Strip-hit latch, Rate monitor, Pre-trigger generator, ambient parameter monitor and analog front-end (AFE) control. A soft-core processor takes care of all the data acquisition (DAQ) needs, configuration of the front-end components as well as data transfer operations between the RPC unit and the back-end servers. Considerable part of the DFE module's hardware, including the soft-processor is implemented inside a high-end Field Programmable Gate Array (FPGA). Digitised data is transmitted to the back-end using the DFE's network interface. Thus, the entire ICAL detector will function like a large Ethernet LAN, with RPC units as LAN hosts together with the back-end DAQ computers. The DAQ back-end servers receive event and monitor data from the DFE modules, build physics events and archive the same, besides providing all the DAQ services and user interfaces.

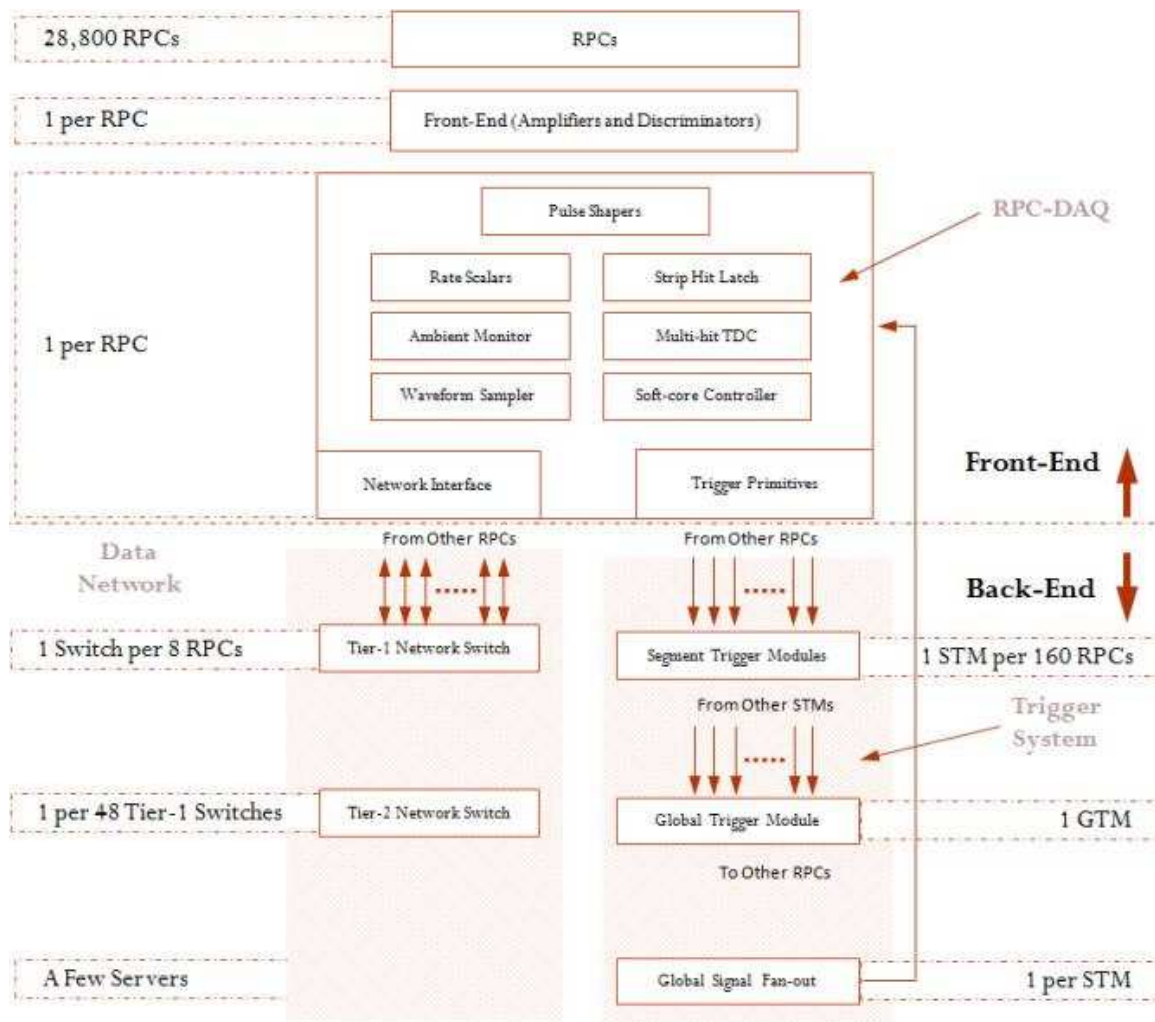


Figure 5: Overall scheme of ICAL electronics

## 7. Status and outlook

INO project involves merely recording and studying of interactions of neutrinos, which are naturally produced particles. Neutrinos are absolutely harmless to humans and all living organisms. Every second our body receives more than 400 trillion neutrinos from the sun and from other sources. Typically a neutrino has to zip through 10 billion billion people before doing anything. In fact, our body contains about 20mg of  $^{40}\text{K}$  which is  $\beta$  radioactive. We emit about 340 million neutrinos/day, which run from our body at the speed of light until the end of the universe! Unfortunately, construction of INO project is delayed due to certain misconceptions among the local people, which are unfortunately planted and propelled by a few activists and politicians. We are currently engaged in an extensive outreach programmes involving young students, local public as well as government officials. Meanwhile, all the requisite approvals and clearances from state and central governments are being obtained.



Figure 6: Mini-ICAL detector in operation

In order to verify the proof of principles of both physics and engineering of the project, a small - but of identical design, a detector named mini-ICAL was built and is being operated successfully. Apart from producing invaluable physics data, this detector also helps testing various engineering designs and long-term performance of RPC detectors and electronics working under the influence of magnetic field. We hope that all the hurdles will be cleared soon and we will be able to build this dream project of the nation - which will add a science temple to Madurai, without any further delay. It may be noted that several experiments in this cutting-edge area of physics are in operation or being built in many countries. Obviously if commissioning of ICAL detector is delayed, we are going to miss out on an opportunity of potential discoveries. Needless to say that will not be a good message to send out to the world scientific community that Indian scientists and engineers are capable of conceiving and building a world class laboratory and experiment, the project proposal was vetted by the committee of world renowned scientists, but still it couldn't be built only due to some misconceptions.



**About the author:** Dr. Satyanarayana did his B.Tech in Electronics and Communication Engineering from J.N.T.University, Hyderabad and Ph.D. in Physics from IIT Bombay. He is working in the Department of High Energy Physics, TIFR since 1983 – and is currently a Scientific Officer (H). He is also a Visiting Professor at the Applied Science Department of the American College, Madurai. His areas of interest include ‘Detectors and Instrumentation for high energy and nuclear physics experiments’. He worked on many major experiments, including a series of underground experiments at Kolar Gold Fields, D-Zero experiment at Fermilab, Chicago and CMS experiment on LHC at CERN, Geneva. Currently, he is engaged in building a mega science experiment called ICAL at the proposed India-based Neutrino Observatory (INO) near Madurai.

Dr. Satyanarayana is a Fellow of Institution of Electronics and Telecommunication Engineers (IETE) as well as Institute of Engineers (IE). He is a member of the Governing Council of Instrument Society of India as well as a Member of Indian Physics Association. He is a Senior Member of IEEE. He is a member of the Executive Committee and Secretary of the IEEE Bombay Section. He is the Chair of its Signal Processing Society. He is also a Executive Committee member of the IEEE India Council and its Vice Chair (Technical Activities). He won IEEE Bombay Section's Outstanding Volunteer Award for 2014 and IEEE Head Quarter's MGA Achievement Award for 2016.

Dr. Satyanarayana has published about 200 research papers and proceedings in national and international journals and conferences. His very first paper won the best paper award by IETE..

He guided and co-guided a large number of undergraduate, master and doctoral students. He served on many of doctoral and expert committees as well as on college/universities' academic councils, boards of studies and advisory boards. He is on editorial and refereeing teams of several prestigious science and engineering journals.

## Centre for Education Growth & Research (CEGR) Recommendation to AICTE

Centre for Education Growth and Research (CEGR) is an independent think tank dedicated towards qualitative, innovative and employability-enhancing education, preparing the next generation as future leaders. The Centre provides a platform for the exchange of dialogue among Academicians, Corporate, media and policy makers and augments educational growth and research.

CEGR requested AICTE through policy recommendation to make it mandatory for all AICTE approved Institutions as faculty members deserves better academic environment.

Minimum one percent of revenue generation of Academic Institution must be spent on the intellectual growth of the faculty members which includes training, research, publication, travel grants, attending seminar, etc.

To download complete policy recommendation to AICTE for approval process handbook, please click on the below link <http://cegr.in/CEGR-Policy-Recommendations.php>

## India to get 100 Gbps internet before 2019 end: ISRO Chief

ISRO Chairman K Sivan has said that India will get internet speeds of over 100 Gbps before the end of next year. He added that India's GSAT-19, launched in 2017, and the yet-to-be-launched GSAT-11, GSAT-29 and GSAT-20 will together provide high bandwidth connectivity and bridge the digital divide. Sivan was speaking at a convocation event in Hyderabad.

# Economics of ADITYA – India’s First Solar Ferry

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## 1. Executive Summary

In this article, Total Cost of Ownership (TCO) of ADITYA is compared with that of diesel ferry and it is established that solar ferry is economically better than diesel ferry not to mention that environmentally it wins hands down. The story of ADITYA, its particulars, and methodology of tracking the various costs that is used to arrive at this conclusion is explained.

## 2. Story of ADITYA

The State Water Transport Department (SWTD) of Kerala (<https://www.swtd.kerala.gov.in/>) operates about 100 ferry boats of different sizes from 75 to 100 passengers all over the state. They were all single hulled boats, either made of wood or steel, and powered by diesel engine. Around 2013, they were facing a big issue.

Although air and water pollution is a significant environmental problem, that was not the pressing issue. The noise and vibration from diesel engine that make the ride tiring for passengers and crew, although important, was not the prime issue. It was also not the smell of fuel that make the ride uncomfortable. The biggest issue they faced at that time was the high operating cost that made the boats unsustainable.

A typical ferry boat operating across the backwater in Vaikom-Thavanakkadavu sector, a distance of 2.8 km, with ticket price of only 4₹ for the journey, generates about 5,000₹ daily in revenue. However just its energy cost for 100 litres of diesel was higher than this figure (about 6,041₹). The direct cost of energy and maintenance is 6,645 ₹/day. Along with indirect costs of the crew and overheads of approximately 3,000 per day, the OPEX was 9,645 ₹/day.

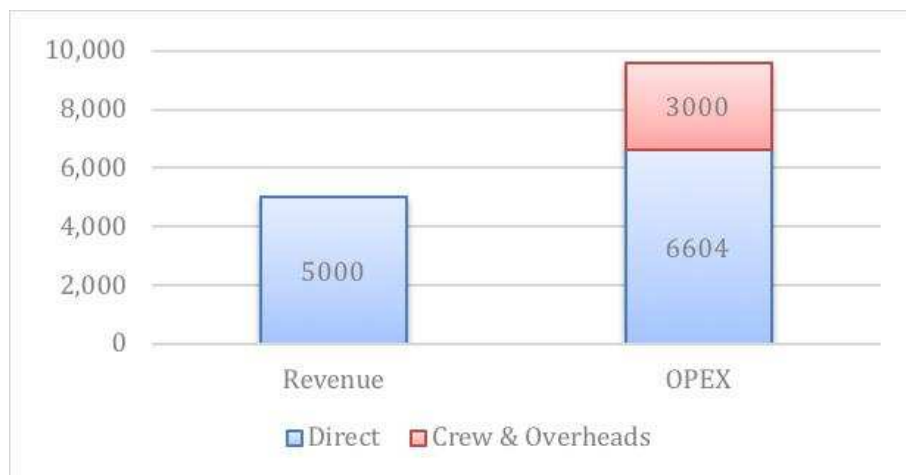


Chart 2.(i). Revenue versus OPEX of diesel ferry

This means that every day the boat ran, the department lost about 4,645₹ considering only OPEX. In this context, SWTD was looking for a solution using solar energy to solve this problem. Once CUSAT (Cochin University of Science and Technology) team led by Dr. Dileep Krishnan submitted the feasibility study for solar ferry in this route, the challenge to solve this problem using solar ferry was thrown to public in form of a government tender. We ([www.navalboats.com](http://www.navalboats.com)) accepted the challenge to design and build this boat, based on our experience and expertise.

When we did that, many people in the industry and academia expressed opinion that solar ferry operating 75 passengers was nearly impossible.

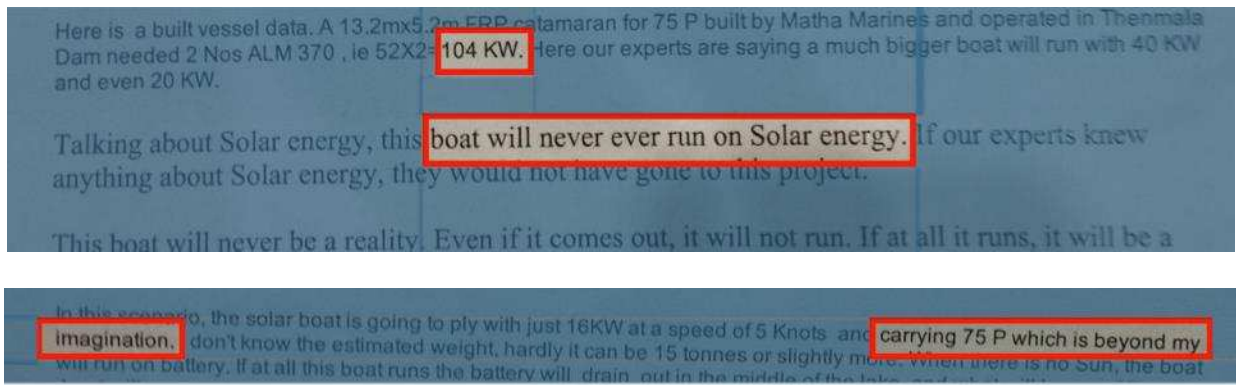


Image 2.(ii). Extract from comments by experts

It is not surprising that such a view was expressed, since existing ferry boats are heavy and with high drag, hence these cannot be retrofitted with solar-electric propulsion. Three things were needed to make solar ferry work. Firstly, the weight of the boat needed to be around 17 tonnes compared to 35 tonnes for typical diesel ferries. Secondly, along with weight reduction, the underwater shape was needed to be optimised to reduce the drag significantly so that just 20 kW motor power is needed instead of 60 kW for diesel ferries to run at 6 knots with 75 people onboard. Thirdly, the power train, consisting of lithium batteries, controllers, motors need to be rugged, reliable and marine grade.

After a year of design, six months of mould making, fifteen months of construction and three months of tests, a total of three years, ADITYA, India's first solar ferry, was inaugurated on 12<sup>th</sup> January, 2017 (<http://bwdisrupt.businessworld.in/article/NavAlt-Launches-ADITYA-and-Gives-India-its-First-Solar-Ferry-/15-02-2017-113019/>). It was done by Union Minister of Power, Sri. Piyush Goyal and Chief Minister of Kerala, Sri. Pinarayi Vijayan. In the first year of operation, ADITYA transported 365,000 people across backwaters, and travelled 22,500 km without a single drop of fuel thereby saving 34,800 litres of diesel. This eliminated 92.8 tonnes of carbon-di-oxide and 8 tonnes of harmful emissions.



Image 2.(iii). ADITYA along with diesel ferry at Vaikom jetty

### 3. About ADITYA

ADITYA is a catamaran ferry boat with GRP (Glass Reinforced Plastic also known as FRP (Fibre Reinforced Plastic)) hull and aluminium superstructure build under IR class (Indian Register of Shipping, a member of International Association of Classification Societies. <http://www.irclass.org>). The vessel particulars are as follows:

Length overall	20.0 m
Breadth	7.0 m
Breadth, demi hull	1.5 m
Depth	1.6 m
Draft	0.8 m
Complement	75 passenger + 3 crew
Maximum Speed	7.5 knots (14 km/hr)
Solar panel	Main system 18 kW (poly-crystalline)
	Auxiliary system 2 kW (poly-crystalline)
Batteries	Main system 2 x 25 kWh (lithium-ion-phosphate)
	Auxiliary system 2 x 5 kWh (lead-acid)
Motors	AC induction 2 x 20 kW (asynchronous)
Shore charging	2 x 6 kW (32 A three phase connection)

The boat has two energy and power train – from solar array, charge controller, battery bank, motor controller, motor, thrust bearing, stern gear, propeller. These are electrically isolated so that an issue in one system does not affect the other. Apart from this each motor is overpowered by 100% so that there is excess power available in need of emergency, high water current, or strong wind. ADITYA operates at service speed of 6 knots, however it can go at 7.5 knots at maximum power under fully load.

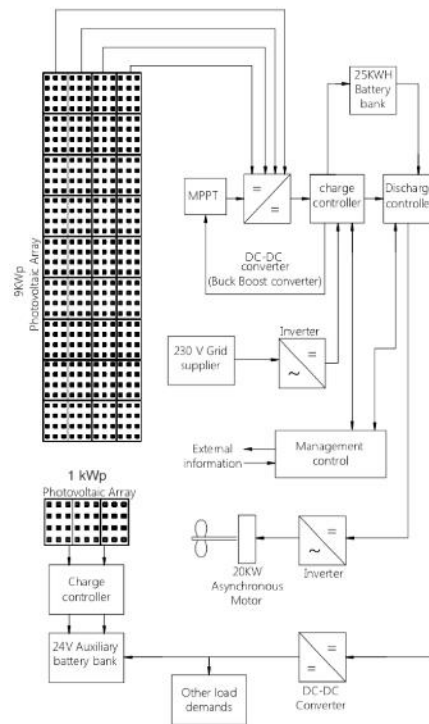


Image 3.(i). System diagram of one side

The battery system meets very high standards of safety, which is essential for public transportation. The battery is approved by DNV-GL as per DNVGL-CP-0418 and DNVGL-CG-0339. It is tested as per IEC 62133:2012 standards. The battery meets IP56 ingress protection and the ventilation system is designed for lifecycle at operating temperature higher than 30 degrees by monitoring charge and air cooling by PLC (Programmable Logic Controller).

The boat has three levels of safety, assigned as N1, N2, and N3. These are parameters in motor, battery and other critical systems in the boat. N1 indicates the level which are just information that do not need any action but indicates that we are approaching level N2. The next level indicates the state which triggers automatic slowdown of motors or some action. The final level, N3, is when the system is shutdown to protect critical equipment.

ADITYA, being catamaran, has high margin of stability. It meets all stability criteria for inland vessels even when overloaded with 200 passengers. In addition the boat satisfies damage stability requirements for single compartment damage. There are submerged bilge pumps installed in all water-tight compartments (ten of them) which will automatically start pumping out water when there is an ingress.

The boat is remotely monitored to ensure high safety and reliability. Apart from monitoring all the parameters necessary to check performance using automatic log (see 4.2), other critical parts like battery is monitored on cell level. Even trouble shooting can be done remotely.

ADITYA operates across the backwaters from morning 7 AM to evening 7 PM and takes twenty two trips daily. Each trip is about 2.8 km ride and takes 13-15 minutes depending on speed, which is around 6 knots. There are three diesel ferries operating in the same route. The boat spends about 5-7 minutes in a jetty for passenger embarkation and there are three longer breaks for tea and lunch for the crew.

## 4. Process

### 4.1. Manual log

A log book is maintained by the crew to note down all the important parameters for every trip. Some parameters are taken at the beginning and end of the trip. For eg. battery SOC (State of Charge), motor temperature, battery temperature. Some other parameters are taken at the midpoint of the journey during steady course, like solar



production, motor consumption, motor RPM and boat speed. At the end of the day battery SOC is noted before shore charging is connected and after completion it is ensured that battery is fully charged.

ADITYA - India's First Solar Ferry										DAILY LOG SHEET										SERVICE VOLTAGE	
Date: 12/10/17		Boat Master Name: Benny . B . Srinivas								Morning: Puvillapudi					Evening: Rajesh					PORT: 26.5	STARBOARD: 26.5
No.	Trip	Start Time	Battery SOC (Start)	Battery SOC (End)	Motor temp (Start)	Motor temp (End)	Battery Temp (Start)	Battery Temp (End)	Solar Energy (End-way)	Motor cons. (End-way)	Motor RPM (End-way)	Speed (End-way)	Warping	Comments							
1	WVW	7:30	74.5	100	78	74	76	76	31	31	0.4	7.0	6.8	143	6.9						
2	WVW	7:49	81.0	74	81	87	60	44	87	88	11	9.3	8.2	83	4.3						
3	WVW	8:50	72.5	72	72	72	72	72	33	33	3.9	4.6	3.6	81	8.0						
4	WVW	9:11	73.2	73	73	73	73	73	22	22	2.2	3.8	3.9	82	4.4						
5	WVW	9:31	74.5	81	74	74	74	74	34	34	4.7	4.3	3.8	71	4.4						
6	WVW	9:52	10.5	97	82	81	77	80	77	80	3.3	5.4	3.0	77	8.4						
7	WVW	10:10	10.2	85	85	81	80	80	67	104	0.6	3.9	3.7	10.5	7.3						
8	WVW	10:38	10.7	83	83	81	81	80	84	104	0.5	3.4	3.2	11.7	7.6						
9	WVW	10:58	11.0	82	81	81	79	77	74	62	0.3	3.6	3.4	3.5	5.4						
10	WVW	11:11	11.2	80	80	77	72	85	82	103	0.7	3.8	3.6	5.4	7.3						
11	WVW	11:33	11.6	80	77	76	73	83	87	108	1.1	3.8	3.4	8.2	7.4						
12	WVW	11:52	10.7	77	72	74	71	71	54	32	1.7	3.2	3.3	5.5	4.4						
13	WVW	12:10	12.2	76	76	73	66	87	107	84	0.8	3.6	3.4	7.0	7.4						
14	WVW	12:31	12.7	72	72	74	86	86	107	104	3.8	3.6	3.4	11.6	10.7						
15	WVW	12:54	12.6	77	73	74	75	65	87	82	0.9	3.4	3.5	1.8	4.4						
16	WVW	1:07	13.0	74	74	77	76	78	80	38	0.5	3.1	3.2	6.8	6.6						
17	WVW	1:11	13.2	81	81	81	83	82	100	102	2.0	3.4	3.3	1.2	8.4						
18	WVW	1:30	13.4	81	82	77	84	87	100	102	3.3	3.4	3.2	6.5	10.3						
19	WVW	1:41	13.5	75	76	67	68	70	70	76	7.8	3.4	3.1	3.0	0.0						
20	WVW	1:48	13.6	67	66	62	77	83	117	99	3.7	3.0	3.1	3.0	0.0						
21	WVW	1:53	13.8	60	60	60	60	60	60	60	0.0	0.0	0.0	6.3	6.0						
22	WVW	1:55	13.8	50	50	50	67	81	73	77	3.1	3.0	3.1	3.0	0.0						
23																					
24																					
25																					
26																					

Image 4.(i). Manual log sample

Each operating day is one page in the log book and in the first year it has 347 pages of operating data.

**4.2. Automatic log**

ADITYA has the one of best features among inland ferries i.e., automatic data transfer to the cloud server. About one hundred forty parameters in the boat are monitored in the central computer of the boat. Every minute this data is transferred to the cloud server using internet present in the boat. The energy curve, 4.(iv), is made using the automatic data.

**4.3. Grid cost**

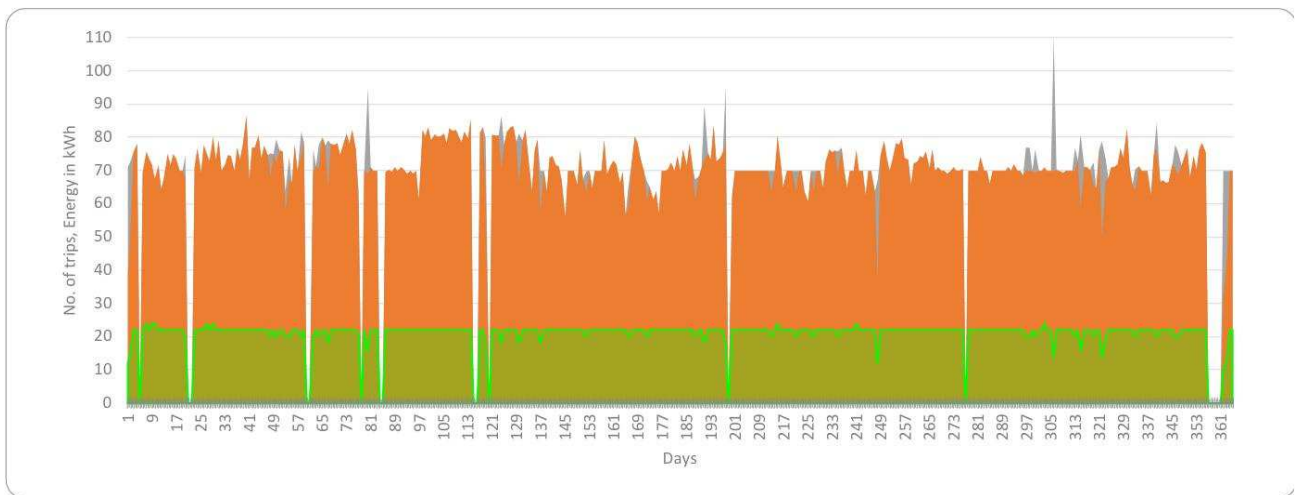
The grid cost was calculated by taking the cost of power from electricity bill of the shore charging facility. Since the power is utilized for jetty and office lighting, the amount of power consumed is taken from the energy meter in the boat. This is about 61% of the total consumption. A total of 13,030 units was consumed in the boat jetty of which 7,969 units was used by the boat (61%). At 7.81 ₹/unit, this comes to total energy cost of ₹62,235 for the whole year.

**4.4. Diesel cost**

The diesel cost has been rising since Jan 2017, following the global crude oil rise. The average cost of diesel for the first year of operation is 60.41 ₹/litre (source: <https://www.mypetrolprice.com/>).

**4.5. Daily Propulsion Energy**

The daily consumption by propulsion motor is tracked in the automatic log. The actual consumption, correction for 22 trips, and number of trips is plotted below.

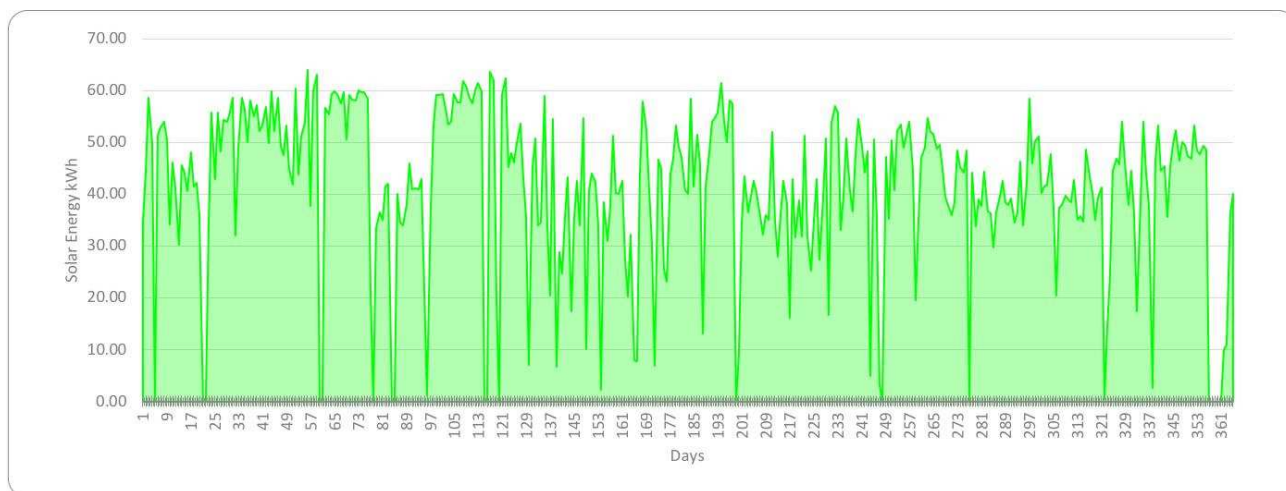


4.(ii). No. of trips and Energy consumption daily

In the first year, for 347 days of operation, the average consumption comes to 71.4 kWh. Once it is adjusted for 22 trips, the average consumption comes to 72.8 kWh per day. The low consumption are days with calm conditions whereas higher are days with adverse weather – current, wind, and waves.

#### 4.6. Daily Solar Production

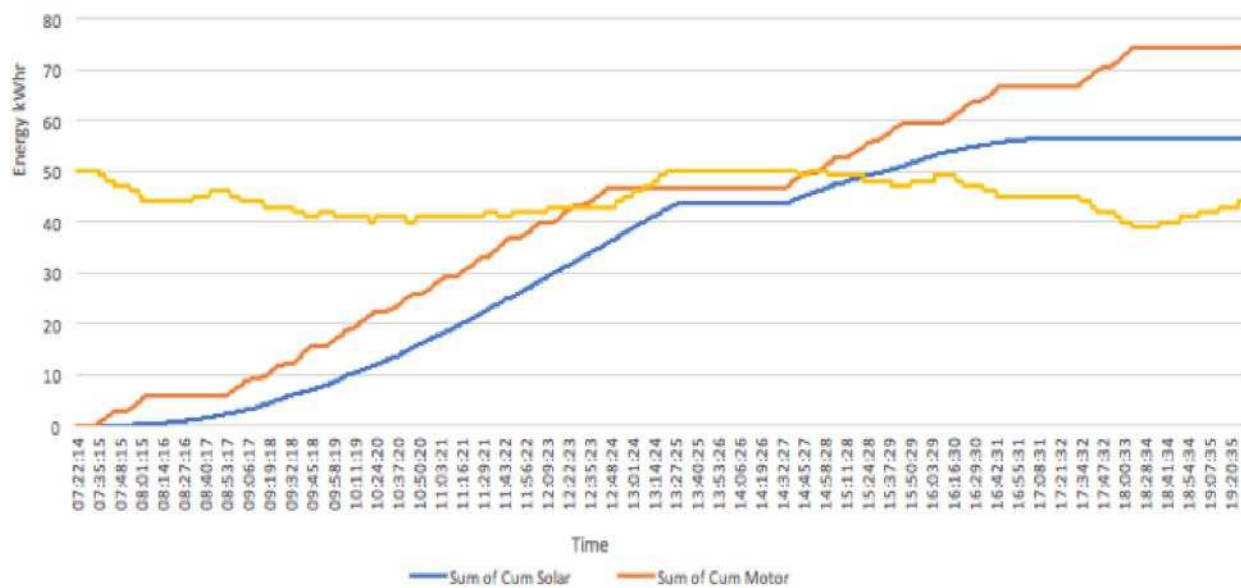
The daily solar power generation is tracked in the automatic log. It varies from extremely low value to maximum of 66 kWh.



4.(iii). Solar production daily

The average daily solar production in the propulsion array (18 kW) is 42.8 kWh for the whole year. This includes the three months of monsoon (Jun-Aug) where the average drops to 38 kWh. For an 18 kW system, the energy produced is lower than expected, around 60 kWh. This is because by the mid part of the lunch break on most days, the battery is full and in the second part of the break there is no space to store the energy from the sun at its peak power. This can be solved with a larger battery bank, say 80 kWh. There were few days with practically not much sun which mostly occurred during monsoon.

The boat needs about 70 units (kWh) of energy for propulsion to perform 22 trips in the day. The below chart shows energy curve of the boat on a typical day. From a 50 kWh, 100% battery SOC (yellow) based on consumption by motor (orange) and production from sun (blue), the battery SOC goes down during the break, however, it once again reached full charge by midpoint of the lunch break.



4.(iv). Energy curve

#### 4.7. Daily Battery SOC and Grid

The battery size for ADITYA is designed for average sunny day. Hence in most days there is no need to charge the battery from shore during daytime. In the below chart, there are two SOC – observed and real. The observed is the

reading in the display in the boat which computes the percentage leaving 10% as reserve. So the real SOC is slightly more.

$$\text{Real SOC} = (\text{Observed SOC} \times 45 + 5) / 50$$

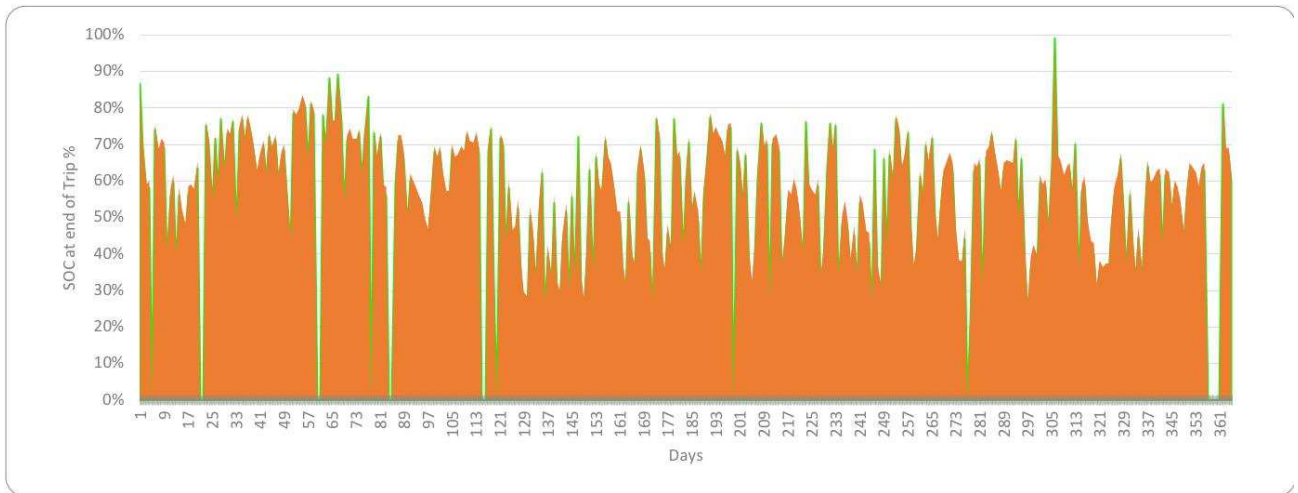


Chart 4.(v) – Observed and Real SOC

The lithium batteries are designed to go to SOC of 20%. If one sees the state of charge in the one year period, the average is 58%. This means that the battery will last longer, over seven years.

At the end of each day operation, the batteries are charged to 100% using grid power. This is the energy cost of the solar ferry. From Table 4.1, we have got the energy cost as 7.81 ₹/unit. Hence the daily cost of energy can be plotted. During the monsoon period from June to October the grid consumption is high.

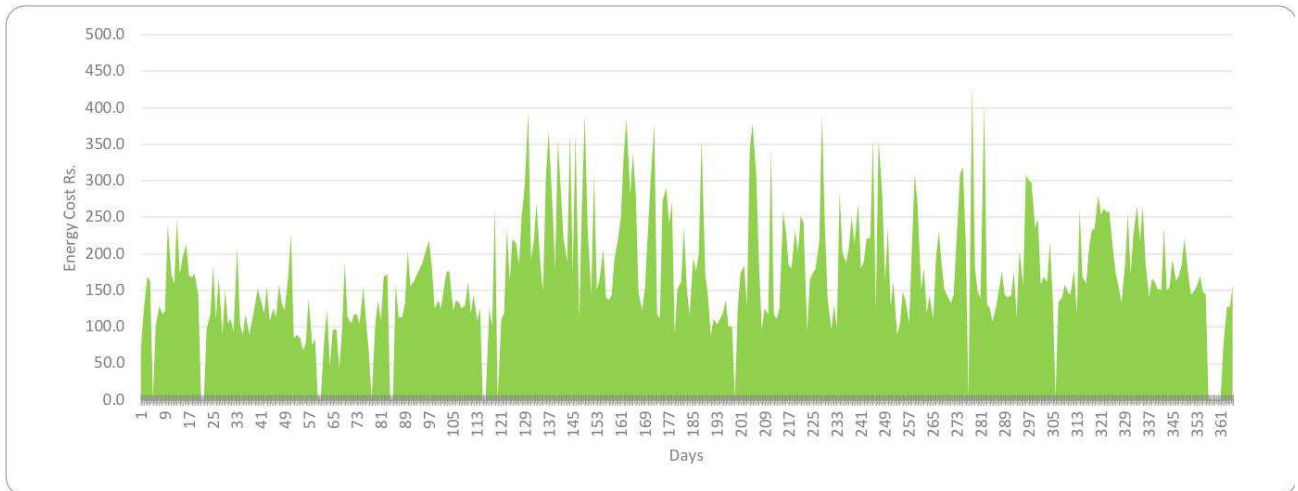


Chart 4.(vi) – Energy Cost

The spread of the grid energy consumption range from very low to ₹428 and the average for the whole year is ₹179. This is very low compared to ₹6,041. for diesel ferry.

## 5. Economic

### 5.1. Framework

When economics of a ferry boat is assessed there are two approaches. The first approach is to assess the total cost and see the returns based on the revenue from passengers. Here the ticket that can be charged and occupancy of the boat becomes important. This approach is used by a private investor in such a project.

The second approach is used by transport departments where the ferry is usually a public service and profitability is not important. Here the operating cost should be covered by revenues from passenger tickets. Also comparison between multiple options can be taken from a cost side. Here the second approach is taken and the total cost of ownership (TCO) is taken for both options.

There are four parts in TCO. They are:

1. CAPEX
2. OPEX
3. Recycling Cost

### **5.2. CAPEX**

This is the initial cost of owning the boat. The cost of ADITYA was ₹1.95 Cr (At 2013 tender price. Five years later, in 2018 such a boat would be 3 Cr.). A diesel ferry with similar capacity (75 passenger), build under IR class (or any other IACS (International Association of Classification Societies) member class) was around ₹1.5 Cr. This is based on adjusting for size and specifications from a similar boat of 100 passenger capacity, build under IR class, awarded to Praga Marine by SWTD for ₹1.9 Cr (2016).

### **5.3. OPEX**

In the total cost of operating the boat, there are three broad cost groups:

- i. Energy
- ii. Maintenance
- iii. Crew and overheads

In the first year the boat operated for 347 days. This was lower because there were six days of motor vehicle strike and three hartals – a total of nine days lost. The other nine days were used for maintenance. We project 350 days operating days going forward.

#### **5.3.(i) Energy cost**

A typical ferry boat operating across the backwater in Vaikom-Thavanakkadavu sector, a distance of 2.8 km, charges only 4 rupees for the journey one side. Each trip take about 13-15 minutes (at speed of 10-12 km/hr). If it operates from 7 AM to 7 PM, taking 22 trips, and having sufficient time for passenger embarkation and breaks for crew, it would need about 100 litres of diesel (at 10 litres/hr).

It is the cost of fuel for running the boat and its systems i.e., running both main and auxiliary engines. For a solar ferry, without any fuel onboard, the energy cost is the cost of grid used to charge battery. From Sec. 4.3, for solar ferry, the total energy consumption is 7,969 units and energy cost was ₹62,235. This energy cost is expected to increase at 5% every year with increase in grid cost.

In a diesel ferry, energy cost is the dominant cost. The daily fuel consumption is 100 litres and for diesel price of ₹60.41, the daily energy cost ₹6,041 (at Rs. 60.41 per litre -- average price in Kerala for year 2017). For first year this was ₹21,02,429. The diesel price is also expected to increase at 5% every year.

#### **5.3.(ii) Maintenance cost**

These are all the cost to maintain the boat operational. There are three kind of maintenance activity. The first type is exclusively for diesel engines. This include replacement of consumables like lube oil and filters as well as engine overhaul charges – both of which are regularly done every 45 days for diesel ferries. For solar ferry, without any engines, this is not there. On an average the maintenance cost is about 3% for lube oil and 7% for filters and engine overhaul of fuel cost. The total is about ₹604 per day. In the first year this was ₹2,10,243.

The second type is the cost of replacing the battery cells. The propulsion battery has a warranty of five years. However based on the battery discharge level (Sec. 4.7), the replacement cycle for the battery would be seven years. It is important to note that at this time, the storage capacity of the battery is expected to be 80% of the new one, and not that it becomes unusable. The replacement cost of the cells is expected to be ₹25 lakhs at the current price. This would be lower considering the annual reduction in price of lithium cells due to increased adoption of electric vehicles.

The third type is cost of replacing or repairing damaged parts, equipment and cost of maintaining the boat in good condition. It is assumed that this is similar in both boats and hence not considered.

#### **5.3.(iii) Crew and overheads**

These are the cost of maintaining the crew as well as the overheads of the head office for boat operation. For these kinds of boats three crew members are needed to operate. Since these are similar in both kinds of boats, this is not considered for comparison.

### **5.4. Recycling Cost**

Most passenger ferries are designed for twenty years. It is not prudent to design ferry systems for longer period since by then a far better technology would have come to enable replacement. At the end of its life, there is a recycling cost, but the residual value of materials and equipment in the boat may be higher than this and hence there might be a net

positive value of the boat. The batteries are recycled by the manufacturer as per the EU guidelines. At the end of its life the recycling cost of the boat is insignificant.

### 5.5. Finance Cost

To factor the time value of money, the difference in initial cost between the boats is financed and EMI for the same is taken as finance cost for solar ferry. The interest rate is assumed at is at 12% although Kerala government has lower cost. The cost difference of ₹45 lakhs (Sec 5.2) need to be financed. After iteration, we can see that in 36 months (3 years), with an EMI of 1.49 lakhs and annual cost of ₹17.94 lakhs this difference in cost can be repaid. The total finance cost for the ₹45 lakhs is ₹53.81 lakhs. After this period, it is huge savings every year.

### 5.6. TCO

Summarising the calculation, we can see that in its life cycle of twenty years, the TCO comparison is:

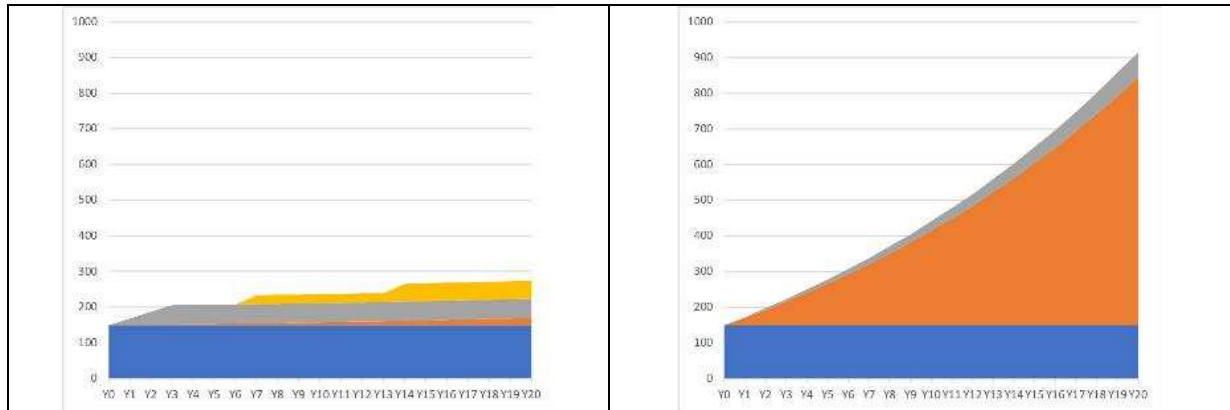


Chart 5.(i) – TCO of Solar ferry (CAPEX, Energy cost, Finance cost, Battery replacement cost) and TCO of Diesel ferry (CAPEX, Energy cost, Maintenance cost) in lakh ₹.

Solar Ferry – ₹274.4 lakhs

Diesel Ferry – ₹914.7 lakhs

The cost of diesel ferry is three times more than the solar ferry.

### 6. Conclusion

From the above calculations one can easily conclude that ADITYA solar ferry is far more economical than a diesel ferry. It is for this reason SWTD has ordered three more solar ferries for public transport. They have already announced plans to phase out all their diesel boats to solar in the next five years.

#### References:

- Sandith Thandasherry, *High fives for solar-powered ferry ops*, *Ship & Boat International*, Jan/Feb 2018



**About the author:** Mr. Sandith Thandasherry after his B. Tech in Naval Architecture from IIT Madras had done MBA at INSEAD with Elmar Schulte Diversity Scholarship. He is currently the CEO of NavAlt Solar & Electric Boats Pvt Ltd at Kochi, the only firm in India with experience of building large solar passenger ferries. Apart from pure solar with no fuel on board, for applications that needs higher speed, longer range, or heavier cargo they have hybrid solutions. The first tourism double deck ferry, 100 passenger capacity, with air conditioning is under construction and expected to be delivered end of this financial year (2018-19).

#### New robot can harvest crops in 24 secs, claim researchers

Researchers have developed a harvesting robot 'Sweeper' designed to operate in a single stem row cropping system. Preliminary test results claimed that by using a commercially available modified crop, the robot can harvest ripe fruit in 24 seconds with a success rate of 62%. The team said that additional research is required to increase Sweeper's work speed and success rate.

# Algorithmic Music Composition

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## Introduction

In the traditional approach, musicians compose music largely by trial and error. They typically use an electronic “Keyboard” or some software such as “Ableton Live” [1], and try out various ideas. Although this is time consuming, it is unavoidable since music composition is a creative process and substantial experimentation is involved before producing music that is considered “acceptable”. In the “algorithmic” approach, music is generated by a computer program with very little or no intervention from a human musician. The interesting thing is that this computer program itself could be generated automatically from data (the Machine Learning approach). Over the past few years, the field of algorithmic music composition has gained a lot of traction.

## How Is It Done?

Talking of algorithmic composition, there are two ways to generate music. The first is to create a program manually by using one of the many libraries and frameworks available. This program, when executed, will generate music. The second approach is slightly more recent. It applies Machine Learning techniques to first build a model by analyzing vast samples of music. This model is then used to generate a new piece of music.

## Approach-1: Writing the Music Composition Program

This involves using a suitable programming language and a framework/library to write a program that generates music. Fortunately, there are several nice tools available for this purpose. I will only mention a few that I have personally found interesting, so it is by no means an exhaustive list.

If you are a Java developer, you can use JFugue[2]. It is a compact Java library that allows you to conveniently express music sequence as a string, manipulate it and finally cause the player to play the music. Here is a toy Java program using JFugue:

```
import org.jfugue.player.Player;

public class Example {
    public static void main(String[] args) {
        Player player = new Player();
        player.play("C D E F G A B C D E F");
    }
}
```

*Figure 1. JFugue Example*

Max[3] is a popular commercial environment for creating music. It is different from many others in that it supports an intuitive visual programming interface and uses “patches” to assemble a piece of music. If we wish to do some exotic stuff, it is also possible to use Javascript to program the Max engine. Another nice thing about Max is that it can be interfaced to a variety of hardware, including the popular Arduino system.

Here is a simple “Patch” (as it is called in Max) that randomly generates and plays MIDI notes:

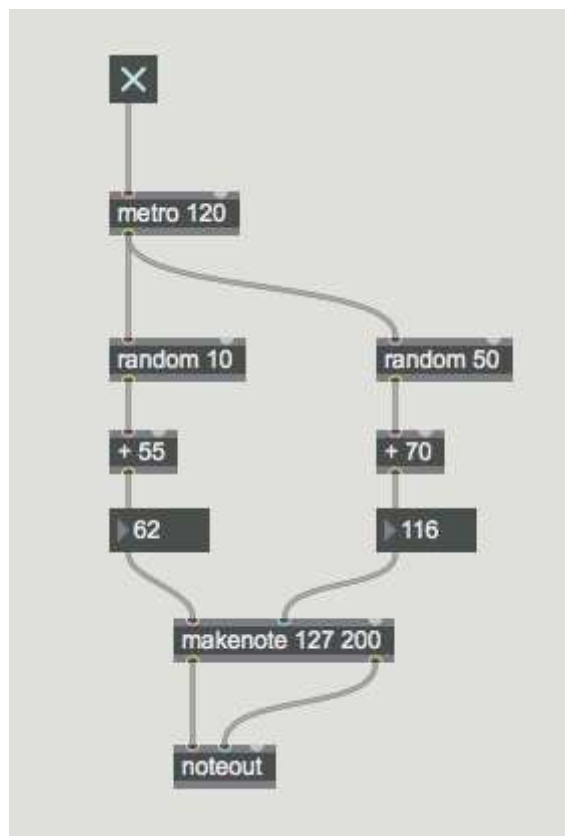


Figure 2. Max Patch

We can use pre-defined blocks of functionality (called “objects”), interconnect them in interesting ways to synthesize music. There are blocks for working with arbitrary audio and video data.

OpusModus [4] is a Common Lisp-based environment for generating music. It comes with a rich library of functions for synthesizing arbitrarily complex musical structures. What I like about this system is that it uses a powerful notation called “OMN” that can symbolically model highly complex multi-channel musical structure. Since Lisp is primarily a symbolic language, we can implement a variety of fancy algorithms to manipulate this symbolic structure.

Figure 3. shows a simple program written in OpusModus. It defines a random collection of 16 pitches from a pre-defined set and puts them together as “quarter” notes, with a tempo of 120.

```
(defparameter count 16)
(defparameter pitch (rnd-sample 16 '(c4 d4 e4 b5 d5 f5)))
(defparameter duration (span pitch '(q)))
(defparameter omn (make-omn :pitch pitch :length duration))

(def-score Example
  (:key-signature 'chromatic :time-signature '(4 4)
   :tempo 120)
  (instrument
   :omn omn
   :sound 'gm
   :program 'acoustic-grand-piano
   :channel 1))
```

Figure 3. OpusModus Example

The music generated by this program, when rendered in the standard musical notation appears thus:



Figure 4. Music in Standard Notation

For an example of music synthesized using OpusModus, listen to this [5] small piece, which I created.

ChucK [6] is a high-performance music language developed by Dr. Ge Wang at Stanford University. It is possible to run ChucK programs on multiple computers and let them interact seamlessly, thus creating a highly distributed music synthesis system.

Renoise [7] is a Digital Audio Workstation (DAW) that allows recording and composing production quality audio. It supports scripting using Lua language, so it is possible to generate music algorithmically as well.

SuperCollier [8] is an open-source platform for algorithmic music composition. It uses an interpreted scripting language called “sclang” to express composition logic.

You can check out a nice web-based app [9] that allows you to configure parameters such as Mood, Tempo and Accompaniment, and then will generate music algorithmically satisfying the stated constraints. No programming is involved from user side.

### Approach-2: Using Machine Learning

In the ML approach, we let the computer analyze a vast amount of existing music, resulting in a “model”. This model can then be used to generate new pieces of music. An important research issue in this case is choosing a “good” representation (encoding) of the music that we are analyzing, so that all information is captured correctly. Recall that the input to any ML processing pipeline is a vector of numbers, not symbols. So if the input representation is not “right”, the resulting model might not be good enough.

Last year, Google released “NSynth” [10], an innovative approach to audio synthesis using neural networks. A list of deep learning tools for music is available here [11, 12]. A very readable introduction on how to use RNNs to generate lyrics and piano music can be found here [13].

### Comparison of the Two Approaches

Most of my research is based on the first approach. It is a very challenging approach and requires one to have a good grasp of the theory of music. Also, to generate good music using this approach, we have to interact with experts in the field and understand how they compose good music (“knowledge acquisition”). We can then try to encode the generation logic in the form of a rule-based system.

The ML approach is fast catching on, for a good reason. There is great progress in ML as a whole, and music generation can borrow ideas from the related fields. The important requirement (and a challenge) is to get hold of a vast amount of “good” music out there, encode them properly, and derive usable models from these. Since we can safely assume that the chosen samples represent good music, there is a good chance of generating good music using ML (of course, the model must be good too!)

### MIDI and OSC

MIDI [14] stands for Musical Instrument Digital Interface. It is a protocol aimed at recording and playing back music on digital synthesizers (hardware or software). When a program generates music, there are two ways to play it. One is using the same computer’s hardware (provided the hardware supports sound and MIDI). The other is connecting the computer to a different piece of hardware such as a high quality digital instrument, or an electronic keyboard. What happens is that the generated music is converted to MIDI format (this is optional; there are other formats too) and sent across to the target system (either the same computer or the external hardware). In fact, it is possible to save the generated music in MIDI format and play it using appropriate software on any computer (or even mobile phone). Even today, MIDI is widely used by synthesizers. Another protocol that is becoming popular is OSC [15] (Open Sound Control). This is much more expressive than MIDI in what can be represented (the details are not important for now). The good thing is that OSC



usually used UDP format and hence it can be sent from one computer to another even wirelessly. It has a highly structured representation in comparison to MIDI and can be used effectively to simulate an orchestra of computers using a master controller. If our chosen music synthesis framework does not support OSC, we can integrate third party libraries available for this purpose. For example, JavaOSC [16] is a Java library for sending and receiving OSC packets.

## The Future

With a lot of research going on in this area, the future looks very exciting for algorithmic music composition. One interesting research problem is to generate music based on the predominant emotion/mood to be captured. For example music that is synthesized for a sad occasion has to be different from one that is meant for a joyous occasion. The next level of advancement is to take a context representation as input and generate music for that context. To give an example of this type, consider Indian cinema. For a romantic song in a movie, the music director gets specification from the film director as to the nature of the scene - the age of the lead pair, whether it is a rural, urban or party setting, and so on. This description could be represented in a formal manner and fed to the algorithm for it to generate the matching music. Perhaps the ultimate one can expect (in the context of cinema) is to give the detailed movie script (in natural language) to the computer for it to come up with the background score and also songs! A simplified version of this would be for the computer to generate music after analyzing the lyrics of a song. The way research is progressing, the above may become reality in the next five to ten years! What will then happen to human musicians? We have to wait and see!

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- 3) <https://cycling74.com/products/max>
- 4) <https://opusmodus.com>
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- 8) <https://supercollider.github.io>
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- 10) <https://magenta.tensorflow.org/nsynth-instrument>
- 11) <http://www.asimovinstitute.org/analyzing-deep-learning-tools-music/>
- 12) <https://arxiv.org/abs/1709.01620>
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- 14) <https://en.wikipedia.org/wiki/MIDI>
- 15) <http://opensoundcontrol.org/introduction-osc>
- 16) <https://github.com/hoijui/JavaOSC>



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**Japanese cafe to use robots run by differently abled people:** A Japanese cafe is planning to use robotic waiters controlled remotely by people with physical disabilities who wouldn't be able to work otherwise. The robots, which are 1.2-metre tall, transmit video footage and audio via the internet for operations including taking orders and serving coffee. The robots can be controlled even if the operator can only move their eyes.

**Amazon unveils microwave that can be used with voice commands:** Amazon on Friday unveiled a microwave that can be controlled by users by giving commands to the company's voice-based assistant Alexa. The users only need to give commands like, "Alexa, reheat my coffee" or "Alexa, defrost a potato" and the microwave will begin working on its own. Amazon has priced the microwave at \$59.99 (over ₹4,300).

# Commercial Buildings and Energy Conservation Building Code of India

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## INTRODUCTION

Energy has become the vital force fueling the life on earth and also plays a significant role in the economic development of any country. Energy is required in every aspect of life, from making various equipment and products to charging our phones. Energy systems in India have evolved over the past six decades along with India's economic development, and the aspiration of 1.2 billion people. Ever increasing urban populations and the improved quality of life in cities have resulted in greater demand for energy. This situation has posed tremendous pressure on India's limited energy resources and has necessitated optimum use of its resources.

The primary energy consumption in India is the third largest after China and USA with 5.6% global share in 2017 (BP Report, 2018). The energy consumption in India is derived from various sources such as crude oil (221.1 Mtoe; 29.34%), natural gas (46.6 Mtoe; 6.18%), coal (424 Mtoe; 56.26%), nuclear energy (8.7 Mtoe; 1.15%), hydroelectricity (30.7 Mtoe; 4.07%) and renewable power (21.8 Mtoe; 2.89%), with a total of 753.7 Mtoe (excluding traditional biomass use) in the calendar year 2017. The present and future growth for primary energy in India and the percentage share of the various resources are shown in Fig. 1 (BP Report, 2018).

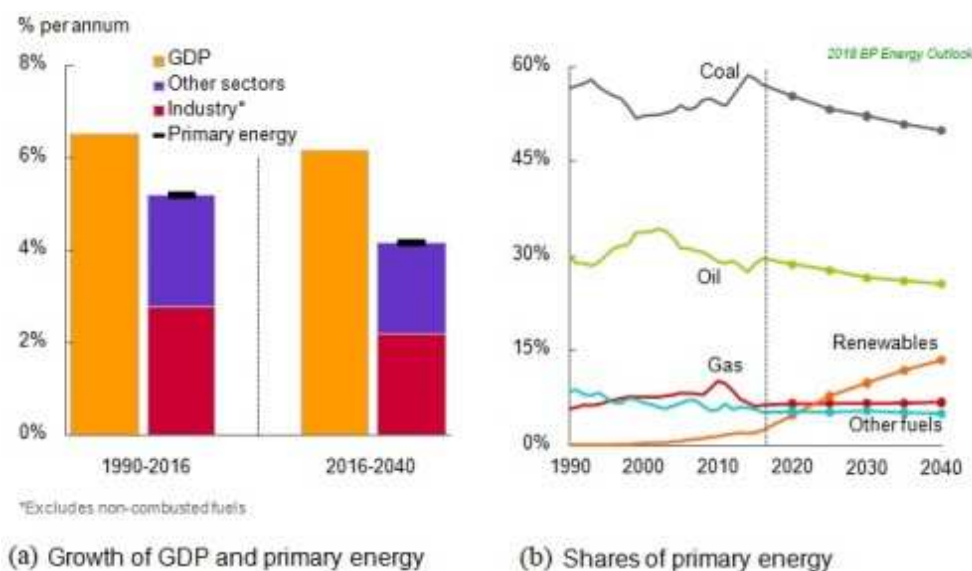


Fig. 1 India's energy consumption from various sources-current and projected demands

Fig.2 shows the current and projected energy demand of different fuels for various regions, including India. As per Mr. Bhaskar Sarma of the Bureau of Energy Efficiency, energy demand in India will increase by a factor of 1.5 to 2.5 by 2030.

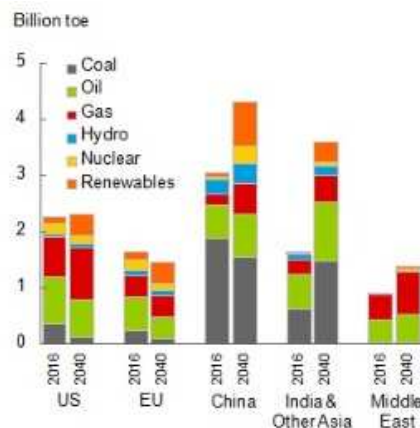


Fig. 2 Primary Energy demand by fuel and region (BP Review, 2018)

It has to be noted that in India, industrial and commercial consumers pay electricity and petroleum product prices that are amongst the highest in the world. Household consumers pay electricity and petrol prices that are highest in the world relative to their incomes. While India's per capita energy consumption will remain much lower than that of industrialized countries, India's total energy consumption is expected to increase significantly, due to its huge population. Due to this threat of energy crisis, various strategies to conserve the available energy, and harness renewable energy from all possible sources have been considered by the government. Efficient energy use reduces costs, energy imports, GHG emissions, and also pollution.

Considering the vast potential for energy savings, the Government of India enacted the Energy Conservation Act (EC Act), in 2001. The Act provides for the legal framework, institutional arrangement, and a regulatory mechanism at the Central and State levels to achieve energy efficiency. The Bureau of Energy Efficiency (BEE) was established in March 2002 under the Ministry of Power (MoP) to implement the EC Act 2001. BEE is the statutory body for development of energy efficiency policy and strategies based on self-regulation and market principles. It also facilitates coordination of energy efficiency at the central level while "state designated agencies" (SDAs) do the same at the state level in 30 states. The EC Act 2001 further mandates BEE to work with designated consumers and other agencies to enforce the provisions of the act. However, there are no provisions in the budget of the central government at present to enforce checks and compliance to the Act.

The Energy Conservation Building Code (ECBC) was introduced in 2007 to guide the design of new commercial buildings – where there is largest scope for energy efficiency improvements. This was revised in 2017 (The Government is considering to revise and update ECBC every 5 years).

### THE ENERGY CONSERVATION BUILDING CODE

Under its statutory authority, the Bureau of Energy Efficiency (BEE) with the support of the Ministry of Power (MoP) launched the Energy Conservation Building Code (ECBC) in 2007, to establish minimum energy performance standards for buildings in India. The ECBC was developed by the International Institute for Energy Conservation (IIEC) under contract with the United States Agency for International Development (USAID) as a part of the Energy Conservation and Commercialization (ECO) Project providing support to the (BEE) Action Plan. The process of development of ECBC involved extensive data collection and analysis regarding building types, building materials, and equipment. ECBC started as voluntary, but made mandatory by Gazette notification of the Ministry of Power on 13th February 2018. The code is applicable to all new building that has a connected load of 100 kW or higher or a contract demand of 120 kVA or higher. The code is also applicable to all buildings with air conditioned floor area of 1,000 m<sup>2</sup> or higher. The structure of ECBC is patterned against that of the ASHRAE Standard 90.1-2004. It has to be noted that the BEE/GRIHA Star Rating System exists independently of the code- It evaluates buildings based on operational energy use and is the only energy-use-specific building label used in India (Williams and Levine, 2012).

The building sector is the second largest employment provider next to agriculture. The building sector contributes to about 5% of the India's GDP, which is expected to rise to 6% in the next 4-5 years. Consequently, the building industry is also one of the biggest emitter of GHGs in India. Buildings account for about 29% of India's electricity consumption and are second only to the industrial sector in emitting greenhouse gases [see Fig. 3(a)]. In addition, the building sector is growing at 8-10% annually. Of the building sector, commercial building space accounts for 31%, with breakdown of energy consumption as shown in Fig. 3(b). Hence, the purpose of this code is to provide minimum requirements for the energy-efficient design and construction of buildings.

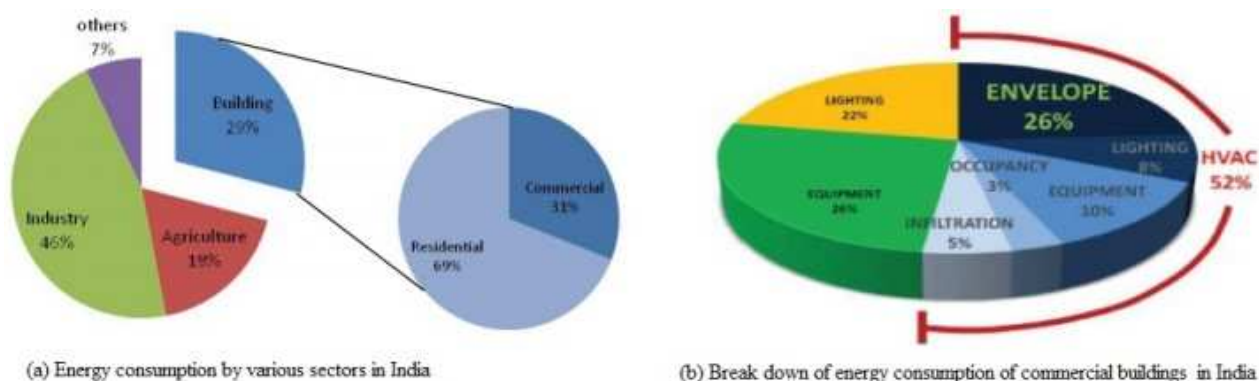


Fig.3 Energy scenario in India (Bano and Kamal, 2016)

ECBC code takes into consideration the climatic condition of the building's location, while suggesting various strategies. As per the code, India is divided into 5 distinct climatic zones as shown in Fig. 4 and the design of building envelop should take into account these climatic zones.

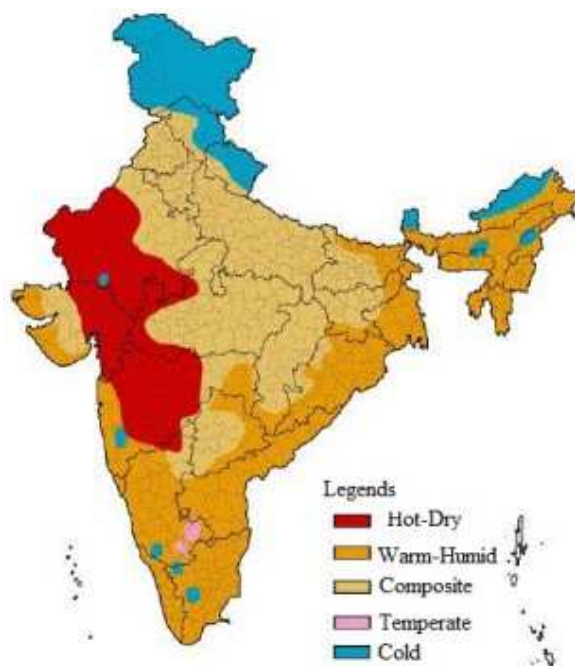


Fig. 4 Climate zone map of India

ECBC is considered as an essential regulatory tool to curb the energy footprint of large commercial buildings. Energy efficient technologies and materials that were not available in the years preceding the launch of ECBC are now commonly available in Indian markets. Hence, ECBC was revised in 2017 to incorporate advanced technologies.

ECBC sets minimum energy performance standards for the design and construction of new commercial and public buildings. As per ECBC Commercial Buildings are divided into various sub categories; i.e., offices, hotels, hospitals, and shopping centers or malls. The components in the buildings which are considered in the ECBC include:

1. Building envelope (walls, roofs, and windows),
2. Heating, ventilation and air conditioning,
3. Water heating and pumping (including solar water heating for at least 1/5 of design capacity, unless systems use heat recovery),
4. Interior and Exterior Lighting and controls,
5. Electrical and renewable energy systems (transformers, motors, and power distribution systems),

In the 2017 version of ECBC there are three levels of energy performance standards: ECBC, ECBC + and SuperECBC. The adherence to the minimum requirements as per ECBC level of efficiency is enough to comply with the code. Other two efficiency levels are of voluntary nature. This feature was added to prepare the building industry for meeting energy efficiency standards in coming years and give sufficient time to the market to adapt.

Thus the minimum requirements of ECBC lists specific maximum and minimum limitations on a number of key building features that affect building energy use. ECBC has both prescriptive and performance-based compliance paths. The prescriptive path calls for adoption of minimum requirements for the building envelope and energy systems (lighting, HVAC, service, water heating, and electrical). The performance-based compliance path requires the application of Whole Building Simulation Approach to prove efficiency over base building as defined by the code.

To comply with the Code, buildings should (a) have an Energy Performance Index Ratio (EPI Ratio) less than or equal to 1 (EPI is defined in the code) and (b) meet all mandatory requirements mentioned under Clauses 4.2, 5.2, 6.2, and 7.2. For example, Table 4-1 of the code lists the minimum daylight area requirements for ECBC Buildings. Row 1 of the table specifies that all business and educational buildings having more than 3 stories above the ground should have a minimum of 40% of its floor area exposed to daylight in range of 100 – 2,000 lux for at least 90% of the year. Similarly, Table 4-10 and Clause 4.3.3 lists the U-factor (with lower numbers indicating better insulating properties), Solar Heat Gain Coefficient (SHGC) and Visual Light Transmittance (VLT) requirements for vertical fenestration for ECBC compliant buildings. Thus,

for a building located in New Delhi, which falls under the composite climate (as per Appendix B, Table 11.1), the prescriptive requirements are: Window to Wall ratio  $\leq 40\%$ , SHGC  $\leq 0.27$ , U-factor  $\leq 3.0 \text{ W/m}^2\cdot\text{K}$ , and VLT  $\geq 0.27$ . Most of the commercial buildings have energy performance index (EPI) of 200 to 400 kWh/m<sup>2</sup>/year. Energy-conscious building design, using ECBC, can reduce EPI to 100 to 150 kWh/m<sup>2</sup>/year in India (Bano and Kamal, 2016). By judiciously designing the building envelope parameters i.e. orientation, shape, walls, fenestrations, shading device and roof, the HVAC load can be reduced in commercial buildings.

The National Building Code of India 2016 (NBC) is the reference standard for lighting levels, heating, ventilating, and air conditioning (HVAC), thermal comfort conditions, natural ventilation, and any other building materials and system design criteria addressed in this ECBC.

## CONCLUSIONS

The ECBC has the potential to transform the way commercial buildings are constructed and to have significant energy savings. Tremendous potential exists for using materials and equipment, such as heat-resistive paints, fly-ash blocks, insulation materials, energy-efficient windows, energy management control systems, and lighting controls. Constructing more efficient buildings will also assist India's strategy to achieve climate target of reducing emissions intensity of its Gross Domestic Product by 33% to 35% from 2005 levels by the year 2030 as part of the Paris Agreement. The use of ECBC is estimated to save 25% to 40% of energy use in buildings. Based on scenarios (high, medium and low) for code compliance, the Administrative Staff College of India (ASCI) and the Natural Resources Defense Council (NRDC) estimated that with a combination of ECBC compliance and voluntary rating programs, India can potentially save more than 3,000 terawatt-hour (TWh) of cumulative electricity by 2030.

However, the impact of ECBC depends on the effectiveness of its enforcement and compliance. Currently, the majority of buildings in India are not ECBC-compliant. Even the National Building Code provisions are not implemented in several buildings in India, as evidenced by building failures during earthquakes, cyclones, and floods. The State Governments, which are the implementation agencies, do not have proper mechanisms to check the implementations. In addition, due to corrupt officials or professionals, it is difficult to ascertain whether the buildings actually adopted the provisions of the code properly. But, it has to be appreciated that the Central Government is taking the right steps. It is hoped that the code will result in energy efficient buildings in future, reducing the energy requirements of our country.

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# Robotic Process Automation – Doing It Right first time!

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## Background



Across industries like Banking, Manufacturing, Life Science and others, business operations involve huge volumes of digital transactions that are manually performed. These transactions are more often repetitive in nature, involve high volumes and are bound by stringent industry regulations.

In order to overcome the challenges with this ever growing transaction volumes and ever increasing need for speed, accuracy and regulatory compliance, several organizations have started embracing automation in general and Robotic Process Automation (RPA) in particular over the last few years.

### 1. RPA – Why? What? How?

RPA in simple terms is creating *Virtual Robot* - Computer programs (BOTs) performing tasks without human intervention.

A summary view of Why, What and How of RPA is depicted below. Further detailing is done in the subsequent sections.

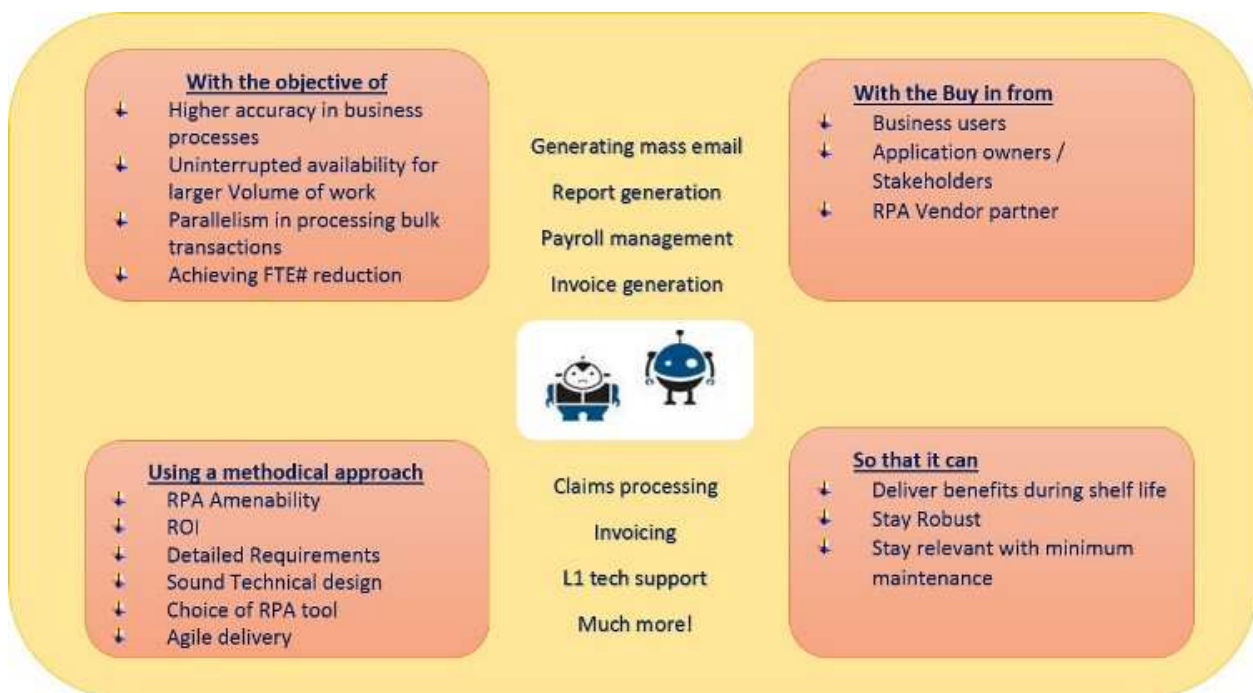


Fig1.0 RPA – Why? What? How?

### 2. Why RPA?

Automation of manual processes is not a new phenomenon and has been achieved through excel macros, simple scripts, application technology enhancements etc. The concept of RPA is further advancement in automation where a non-intrusive application is developed using new age tools to mimic human actions. However, it should not be considered as default option for automation. Automation that really benefits from the features of RPA tools should only be considered for RPA.

The expected benefits of RPA include

- o Increased accuracy
- o Reduced turn-around time for voluminous transactions
- o Reduced cost
- o Optimization of man power etc.

However, a wrong choice of process or the RPA tool could result in

- Loss of Trust in RPA
- Negative Return On Investments (ROI)
- Inefficient automation with minimal to negligible benefits
- Inability to remove human intervention

### 3. What to automate?

A business process that is chosen for RPA should be assessed for

1. **RPA Amenability** - Processes involving human judgment, multiple human interventions and un-standardized processes should be assessed and the level of automation that is feasible should be understood by business and technology stakeholders. It worthy to note that 100% automation of any process might not be feasible in all cases. There should be mechanisms in place to derive benefits from the level of automation that is possible for a business process.
2. **Return On Investment (ROI) Analysis** - ROI should be a factor of volume of data processed, time taken by human user, frequency of the task vis-a-vis the cost to build and maintain the RPA solution including infrastructure and license cost. As a general thumb rule, the ROI should be positive in the first **12-18 months** of RPA implementation
3. **BOT Requirements** - Based on our experience the number of BOTs replacing a human FTE should not exceed 1. *Ideally the BOT to human FTE ratio should be < 1.*
4. **Process Optimization**: It is also key to determine if the business process should be first re-engineered to optimize and remove any redundancies that have crept into the process flow over a period of time.

### 4. How to Automate?

RPA projects need not be executed using the standard SDLC development life cycle applicable for Development projects.

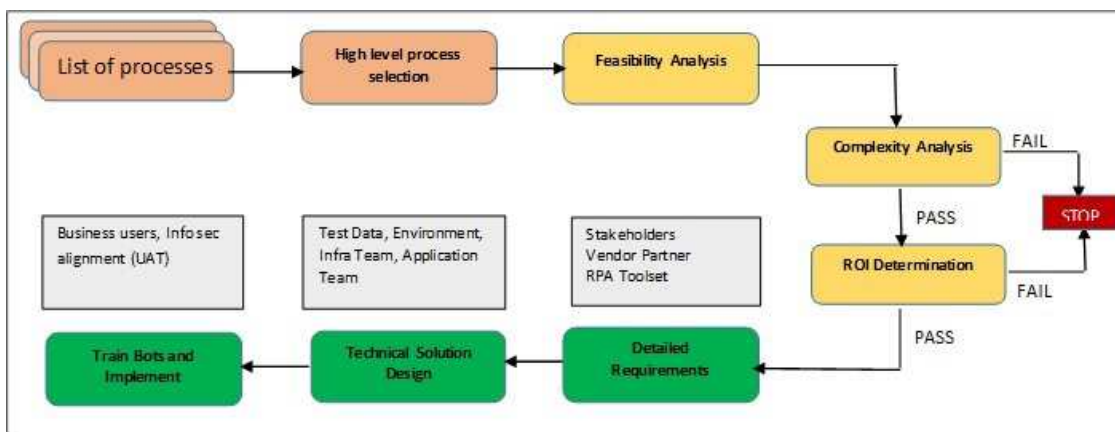


Fig 2.0 – Automation Journey

#### 4.1 Determining RPA amenability

As depicted above, the processes chosen for RPA should be subject to **Feasibility analysis** and **Complexity analysis**. The feasibility analysis should factor the number of human interventions and decision in the process and other technical challenges (like presence of Optical character recognition (OCR), multi factor authentication etc.) which are difficult to be automated using standard RPA features. The complexity analysis should be based on number of users, number of interfaces, types of interfaces, volume of data processed, presence of any complicated business logic, need for standardizing or optimizing the process etc.

Based on the feasibility and complexity of the process, the % automation that can be achieved is derived. Effort required to build, test and maintain the BOT should be computed and compared against the expected benefits

#### 4.2 Requirements and Solution Design

The process selected for automation should go through detailed requirements phase. The AS IS process documentation (Process Manual/Handbook) is likely to be available with the business users. This should be reviewed and converted to detailed RPA requirements document. The requirements should capture all the **business flows** including the normal flows, exception flows and steps that require human interventions.

The **solution design** should determine the BOT requirements, performance requirements for the BOTs and the approach to be taken wherever manual intervention cannot be eliminated. This should also cover potential process optimization so that BOTs can efficiently perform the same activity better.

### 4.3 BOT Development Life cycle and Support

The **Build (Train the Bot) and Test** cycle can be done in agile way in short cycles if the requirements are captured in detail with strong solution design. A separate system testing phase can be done away with and instead an extended User Testing by end users of the business process can be planned. Since BOT behavior is very sensitive to minor changes between the environments, the test environment and test data should be representative of the production environment.

Once the BOT is functional in production, the production support team takes over the maintenance aspects of the BOT which includes monitoring of BOT as per schedule and reviewing logs for any failures.

### 5. Choice of RPA tools

Several industry standard tools for RPA have emerged over the last few years - Automation Anywhere, Blue Prism, Workfusion, UI Path, Assist Edge to name a few. A Key factor that influences the choice of RPA tools is the ability of the tool to support specific automation needs like ability to process OCR, need for Cognitive decision making, need for Machine learning ability etc. Most organizations have Automation COE which assesses these factors and recommends that right choice of tool.

### 6. Business & Technology Collaboration

Following fig. depicts the business and technology priorities and collaboration required for successful RPA journey

BUSINESS CONCERNS		COLLABORATE	TECHNOLOGY CONCERNS	
Process Pipeline	Business Objective	Complexity and Feasibility Analysis	RPA tool	3 <sup>rd</sup> Party engagement
Regulatory Compliance	Geography	Prioritized list of Processes for Automation	Information Security	Delivering to Plan
ROI	Expected Shelf life	Testing	Interfacing Applications	Maintenance

Fig 3.0 – Business and Technology Collaboration

### 7. Road Ahead for RPA

The capabilities of RPA tools are expected to evolve over the next few years. It is important that organizations and technology partners embracing RPA build deep expertise in various RPA tools by investing in training and development. The approach to process selection for automation is also maturing with organizations learning from earlier RPA implementations and taking a more informed approach to process selection.

Over a period of time, industry observers have also recalibrated their views on RPA. From the hyper optimism demonstrated few years back, the challenges and learnings from various real life implementations have resulted in industry taking a more pragmatic view in terms of benefits and ROI of RPA. From a customer stand point, choosing the right business process from amenability and ROI perspective is the key to **“doing it right the first time”**.

#### About the Authors



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# Kerala Floods - A Model of Rescue and Rehabilitation using Information Technology and Social Media based Crowdsourcing

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Kerala, the green state rich with 44 rivers within an area of 38,852 km<sup>2</sup> and a high population density of 860/km<sup>2</sup> faced its worst flood of the century in mid-August 2018[1]. Rampant monsoon rainfall, landslides and the simultaneous opening of 44 dams [2] out of the 82 in the state caused devastating floods in the coastal state of Kerala [3]. The casualties were around 500 and the total loss of the state was calculated to be around 20,000 crore Rupees [4]. The National Disaster Response Force (NDRF) along with the Indian Army and Indian Navy launched one of its largest rescue mission, evacuating over 10,000 people. The response to the incident was lauded as a unique self-help mission due to the way in which the survivors and victims' worked together in the relief and rehabilitation process. The fishermen in the coastal state of Kerala with their sturdy fishing boats played a pivotal role in the rescue mission by shifting a large number of people to safer areas.

The Kerala floods also demonstrated how the usage of Information Technology (IT) and social media backed by public volunteering could build a self-evolving data crowdsourced platform that could aid the rescue and rehabilitation processes [5]. Crowdsourcing is the method of obtaining information or input into a task by making use of the services of a large number of people or devices, either paid or unpaid, typically via the Internet. Kerala, being one of the states with high digital literacy in India, also has a large smartphone using population.

## Using crowdsourcing as a tool for rescue



A few student volunteers from the IEEE Kerala Section - which has a strong presence in 79 Engineering Colleges of Kerala [6] - with the support of the state run Kerala IT Mission, came up with a portal named keralarescue.in to collect help requests from across the state. The Chief Minister of Kerala released it as the official online portal for the state's rescue mission. Volunteers, majorly consisting of NGO (Non Governmental Organisation) activists and the energetic youth of Kerala, made phone calls to verify the legitimacy of inflowing requests and escalated the issue regional wise to the authorities.

Kerala's upper hand in Information Technology showed its prowess, almost 2000 people were working day and night behind the portal to

continuously improve and maintain the system. Engineers around the world worked from different time zones and ensured that development and maintenance happened round the clock. Many IT companies dedicated their development teams exclusively for this work [7]. As the rescue operations progressed, new features that could help the operation were added, and coordination was done using the popular cloud based collaboration platform Slack.

54,933 people who registered themselves as volunteers in the website did the works of verification and ground level support. The unique visitor count of the website crossed 1,363,704, and 45,587 help requests were posted through the portal.

One of the main challenges faced in the initial days of rescue was the unavailability of helpline numbers. Most of the government provided numbers were not backed with sufficient capabilities to handle the large number of incoming phone calls. Thus when many people were deprived of a chance to raise their issues with the administration, they started posting WhatsApp messages and live videos in Facebook requesting for help. Popular and active Facebook pages with regional influence, like the meme (troll) pages suspended the release of their usual posts and started posting the rescue requests from the public.

When this happened, many big and small groups like Compassionate Keralam and Anbodukochi [8][9] were formed both inside and outside India in order to collect these social media messages, organise them using spreadsheets and databases, verify them by making phone calls, marking priority level by considering factors like number and ages of people trapped, and to prepare proper SOS messages with geo-tags to pass on to the rescue teams through the volunteers in the district level administration. Once a rescue request was fulfilled the status would be updated. The volunteers were handling an average of 100 calls per day on identifying and verifying requests.

### In Relief and Rehabilitation



As the flood levels started rising, the state also faced critical issues in managing the relief camps, since the focus of the hour had been on rescuing maximum people. Volunteering groups took up the initiative and gave support to government officials by deploying a network using WhatsApp groups where the requirements of relief camps were mapped with people who were ready to provide the supplies. Massive supplies and relief materials were brought in by the public at different hubs located at the drier regions which were less affected from the floods. These hubs acted as central collection points from which materials were redirected to camps as per demand. Almost 500 truck loads of such relief materials collected from the public were supplied from the state capital Trivandrum, and more supplies came in from the neighbouring states and cities like by road, rail and air. The efficient communication between the collection points and public through social media made sure that the public brought only those materials which were required in the camps.

Administrators, celebrities and public figures also appealed for public support in different forms through the social media. The response of the public on the ground level was overwhelming. From truck drivers to grocers to textile shopkeepers who gave their services and materials for free, everyone played their part in the relief activities. IEEE SIGHT also played a significant

role in the flood relief activities by fabricating improvised power banks and flash lights as relief material, helping in restoring electrical appliances and electricity supply etc. [15]

The determination of the telecom operators to keep the networks intact played a significant role in the success of this implementation. Many operators announced free calls and data over their networks during the floods to avoid any hindrance to the rescue operations.

### Comparison with similar models

Similar digitally led relief initiatives also happened during the Nepal Earthquake of April 2015, especially under the leadership of Kathmandu Living Labs (KLL). KLL played an instrumental role in mobilizing thousands of online volunteers in creating rapid digital and paper maps of earthquake-affected areas immediately after the earthquake [10].

Information Technology was primarily used for building crowd sourced maps during the Nepal Earthquake in 2015 and Haiti Earthquake in 2010 [10], while it was used as a means to collect the relief requests from victims during the Kerala Floods. The Ushahidi was an open source platform which was created in 2008 to enable the mapping of crowdsourced information about the violence that followed the 2007–2008 elections in Kenya. Its free services were used in Nepal in 2015[10], and was also adopted in Kerala during the floods.

India saw the first prominent use of social media as a tool in rescue and rehabilitation during the Chennai floods of 2015. Many crowdsourcing technologies were used to identify the most affected places and blocked roads [11]. Tamil Nadu, the state whose capital is Chennai, happens to be the nearest neighbour of Kerala that shares a diaspora of Keralite working population. Thus the systems and expertise adopted during the Chennai floods could be easily adapted into the Kerala scenario.

## Discussion

The use of digital technology in post-disaster relief is a tool that can be adopted in any developing country when it faces a crisis with the cellular networks withstanding. When the rescue helpline numbers provided by the Government failed to deal with the magnitude of the situation, crowdsourced data was used in large scale for many purposes, including collecting help requests, organising and matching them to supplies, to mark flooded roads and areas, to create a geographical map of demands and supplies etc. An immediate rescue operation for a pregnant lady was made possible due to the crowdsourced data [12].

However, around 25% of the generated data entries were duplicates, since people were posting multiple requests for same issue. This was fixed using a variety of measures, starting from the simple measure of affixing date and time stamp with the queries and messages, to the usage of algorithms to filter data based on phone-numbers used in the requests. Similarly, a large quantity of food was wasted during the initial days because many people prepared food in response to the same requests. This issue was identified later on and fixed with more coordination and tracking of requests. Currently, IT based applications are being used extensively for the rehabilitation process, especially for efficiently matching the requests of people with potential help providers, and for spreading reliable news and information about the right methods of waste disposal and epidemic prevention [13][14].

There was widespread criticism that only those social media rescue requests with emotional content got immediate attention and that multiple rescue attempts were made for a particular request. Since many of the messages still circulated around these media even after rescue it led to confusion and wastage of valuable time and resources. Crowdsourcing is not an efficient model to use for rescue operations, because it always comes with the problem of biasing and duplication of data which can be a very strong disadvantage during rescue operations. Meanwhile it can be a successful tool for rehabilitation since the level of urgency is lowered, allowing for more efficient filtering and verification of data.

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## About the Authors



Sebin Sabu is a recent graduate of the Department of Electrical and Electronics Engineering, TKM College of Engineering, Kollam, Kerala. He was an active volunteer of IEEE and the Technical Coordinator of the Student Branch at his college. He was also a Berkner fellow of the American Geophysical Union. He is currently working as Junior Engineer at HODO Medical Informatics, Trivandrum, Kerala.

<https://scholar.google.co.in/citations?user=-sMqN7IAAAAJ&hl=en&oi=ao>



Nora Elizabeth Joby is a recent graduate of the Department of Electronics and Communication Engineering, National Institute of Technology, Calicut, Kerala. She was an active volunteer of her Student Branch and the Women In Engineering (WIE) Chapter. She was also a Berkner fellow of the American Geophysical Union.

<https://scholar.google.co.in/citations?user=uoV5MbwAAAAJ&hl=en&oi=ao>

## Story of keralarescue.in

A report by  
**Mr. Muraleedharan Manningal**  
Head - State eGovernance Mission Team  
Principal Consultant, India  
Co-Chair, Government Relations, IEEE Kerala Section

**11th August- New update from national daily :** “Almost half of Kerala is reeling under floods caused by incessant rains over the past few days. The worst affected districts are Palakkad, Ernakulum, Wayanad, Alappuzha, Idukki and Kozhikode where NDRF, Army and Navy have been pressed into service for relief and rescue work. 29 people have died in the flood, while 54,000 people have been rendered homeless. The water level in the Idukki dam has been rising over 2401 feet against reservoir capacity of 2403 feet. All shutters of the dam have been opened for first time in 40 years.”

Soon after reading this news, I received a call from one of the Student Representative from IEEE Kochi Hub to enquire about the possible options to support volunteering activities. While this was indeed a great thought, I enquired the possibility of getting few developers to create a portal to enable easy and open collaboration between various stakeholders such as volunteers, potential contributors, citizen who needs help and Government authorities. Within no time, a team of 8 people were mobilised from various locations joined with various skills, just adequate to design and develop the portal by selecting right open source technologies and to host in public cloud. Created the first WhatsApp group for interactions, with the committed efforts from our young engineers, the first version of our Keralarescue.in portal went live within 14 hours on 11th Aug. In parallel, we mobilised over 200 IEEE student volunteers from various colleges in Ernakulam, Palakkad and Wayanad to support the collection of materials from 12th onwards for the flood affected people staying at various camps. The Execom team from IEEE Kerala extended, as always, the helping hand for any request from the development team and from the volunteers.



Fig : Schematic diagram of Keralarescue.in

When we shared the idea on the portal and the volunteering activity with the District Collector in Ernakulam and Sub Collector in Palakkad, the response was very encouraging. We were able to get approx. 500 volunteers on 12th itself and the access to the portal was showing and fast increasing trend. Looking at the flood situation in the state and the adoption and acceptability of the portal by public, we had a discussion with the state Government officials on 13<sup>th</sup> Aug. We received a very positive response and consensus from Government to use this platform for flood relief operations in Kerala. On 15<sup>th</sup> Aug, **Hon. Chief Minister of Kerala**, announced this as the portal for coordinating the flood relief activities in Kerala through his facebook. By that time, there were over 15,000 volunteers registered in the portal with over 10,000 help requests. The journey thereafter the journey of the portal is history..... people across the globe started using

this as THE PORTAL to seek help, register for volunteering service, get contact details of various Government helplines across the state, to get the requirements at various districts, to get information on various updates from government, to get the details about various flood relief camps and collection centres setup at various parts of the state etc. This was one of the worst situation the state had ever faced in the last century, most of the state was under red alert, all rivers are in spate, shutters of 35 major dams were opened and closed one of the major international airport in the state.

The development team got enhanced with the addition of more members from wider IEEE community in the state, professionals from various organisations. Some of the conscious decision taken on the design considerations such as the adoption of Open source Technologies (PostgreSQL, Python with Django framework), Crowd sourced – open development approach, use of GitHub, use of collaboration channels such as Slack helped in the team addition and agility in the development and delivery using DevOps. While many offered needy volunteering support in the field, the technology team from various locations offered round the clock support with over 90 contributors in GitHub, over 1900 members in the slack channel. Technology team offered continuous enhancement to the portal with needy features such as information on camps, inclusion of flood maps, mapping of Camps and collection centres in the Google map, requirements in camps and in districts, regular updates from Govt. and various departments etc.

From 16th, some of us moved to the Government Secretariat control room and was coordinating with various groups from there. To our surprise, many organisations were using the information available in this portal to offer rescue support. A group of 500+ students from Indian Institute of Technology(IIT) / Indian Institute of Science (IISc) from Bangalore, Hyderabad etc. setup a call centre and reached out to the numbers given in each of the help requests, while their team in the field offered local rescue support. They were able to support over 30,000 people.

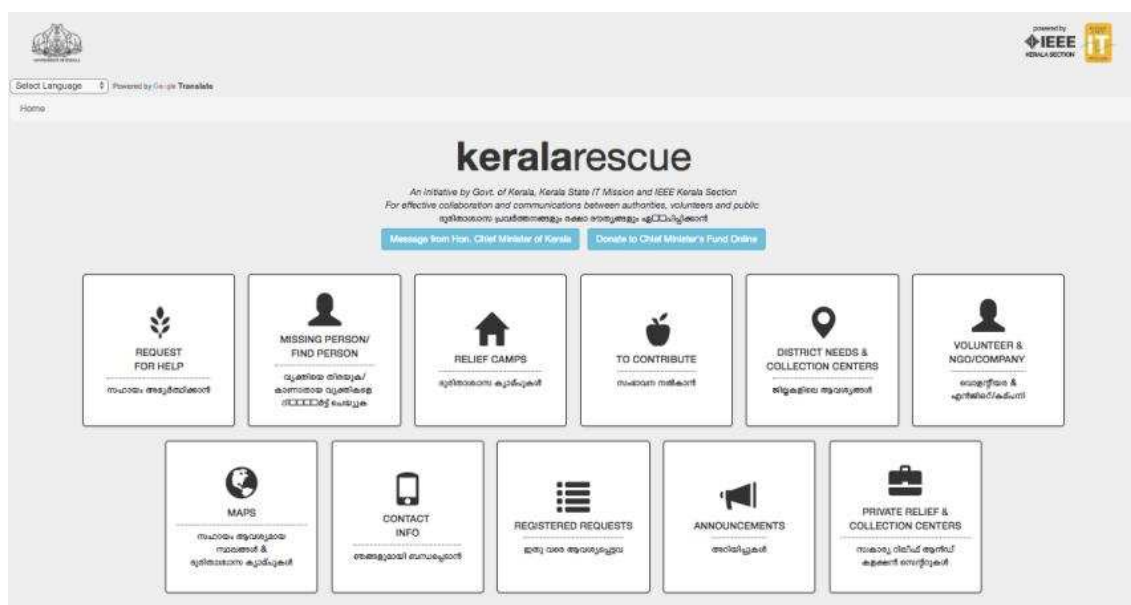


Fig : Keralarescue.in home page

One of the organisation from Trivandrum was checking the requirements of approximately 4000 camps and shared the details with the control centre to enable support. With the interaction and intervention from the Government officials, we were able to enable support from the nearest Civil supplies office to supply food grains and other needy items. And there are many more such cases which got revealed through various people and media.

Some of the statistics for the 2 weeks of operation are:

- ✓ Over 55,000 registered volunteers
- ✓ Over 45,000 help requests
- ✓ Over 17 Million hits on the website
- ✓ Over 1.2 Million people in camps
- ✓ Setup Over 4000 flood relief camps across the state
- ✓ over 1000 commits
- ✓ over 1900 users in slack
- ✓ **ZERO outage** during 2 weeks of operation

This is indeed a true demonstration of the talent and capability of our new generation and their commitment to join hands to develop Keralarescue.in in a true crowd sources model, leveraging open source latest technologies ensuring quality delivery. Many organisation, Google, amazon, Microsoft etc. offered their help... the true help we need at that juncture. Thanks to the great effort and support offered by all the organisation, individuals across the globe. A special THANKS to our young IEEE members, who laid the foundation for this portal, which has become **THE PORTAL for KERALA RESCUE**.

This model can be easily replicated to the disaster management situation and the source code is accessible to the public through GitHub. Secretary, Department of Electronics and IT, Govt. of Kerala had invited the core team and formally thanked the great efforts of the team and given a certificate of appreciation. IEEE Kerala Section had recognised the efforts of the core team and the support of various student chapters in the flood relief activities and given a certificate of appreciation.

## Appeal

Kerala Section and members would like to appeal to you for generous support from all the Sections and individuals for the Reconnection Boards programme. Currently the major contributions have been from Rs. 5,00,000 from the Students Council, NIT Trichy and IEEE Nepal for Rs. 1,00,000 request other sections to match their generosity. Please donate by visiting IEEE Foundation page

<https://www.ieeefoundation.org/ieee-kerala-section-disaster-response-project-fund>

Or Sections in India may just inform Mr. Harish Mysore of IEEE India office and they will do the needful in transferring the money to us. The India office has also the 80G Certificate for Income Tax Benefit and they will issue it to Individuals and Organisations. For any clarifications please write to Amarnath Raja - [a.raja@ieee.org](mailto:a.raja@ieee.org)

All Donations will be gratefully received, with proper mention.

**Amarnath Raja**  
(On behalf of Kerala Section)

**Autonomous delivery concept car with 'Robo Pods' unveiled:** French carmaker Renault has unveiled its autonomous, electric concept car EZ-PRO that can deliver a wide range of goods and services in a city. It has 'Robo Pods' that can carry packages or act as a food truck or a portable grocery store. The system also has a 'Leader Pod' where a human can sit to carry out administrative work.

**Wearable tech that turns a user's skin into loudspeaker made:** Researchers in South Korea have developed a wearable technology that can be attached to a user's skin and work as a loudspeaker. The technology consists of ultrathin, transparent, and conductive hybrid nanomembranes with nanoscale thickness. The nanomembrane loudspeaker operates by emitting thermoacoustic sound through the oscillation of the surrounding air brought on by temperature differences.

**Former Google CEO says internet will split in two by 2028:** Former Google CEO Eric Schmidt at a recent event said that there will be a "bifurcation into a Chinese-led internet and a non-Chinese internet led by America." "If you look at China...the wealth that is being created is phenomenal," he added. "I think you're going to see fantastic leadership in products and services from China," he further said.

**Vodafone & Idea come together to create India's #1 telecom company:** Vodafone India and Idea Cellular have come together to create the world's #2 & India's #1 Telecom company and promised to combine their strengths to serve their customers more of everything. They've committed to a stronger 4G Network, smarter technologies - 5G, IoT, always-on digital customer service, m-commerce among others. It promises unmatched value across services for all its customers.

**Germany launches world's first hydrogen-powered train:** Germany on Monday launched the world's first zero-emission hydrogen trains which will run on a 100-kilometre stretch. Built by French rail transport company Alstom, the trains are equipped with fuel cells that produce electricity by combining hydrogen and oxygen, leaving water and steam as the only emissions. The trains can travel up to 1,000 kilometres on a single hydrogen tank.

# Review of Momo attack in WhatsApp

**Mr. S. Manikandan**

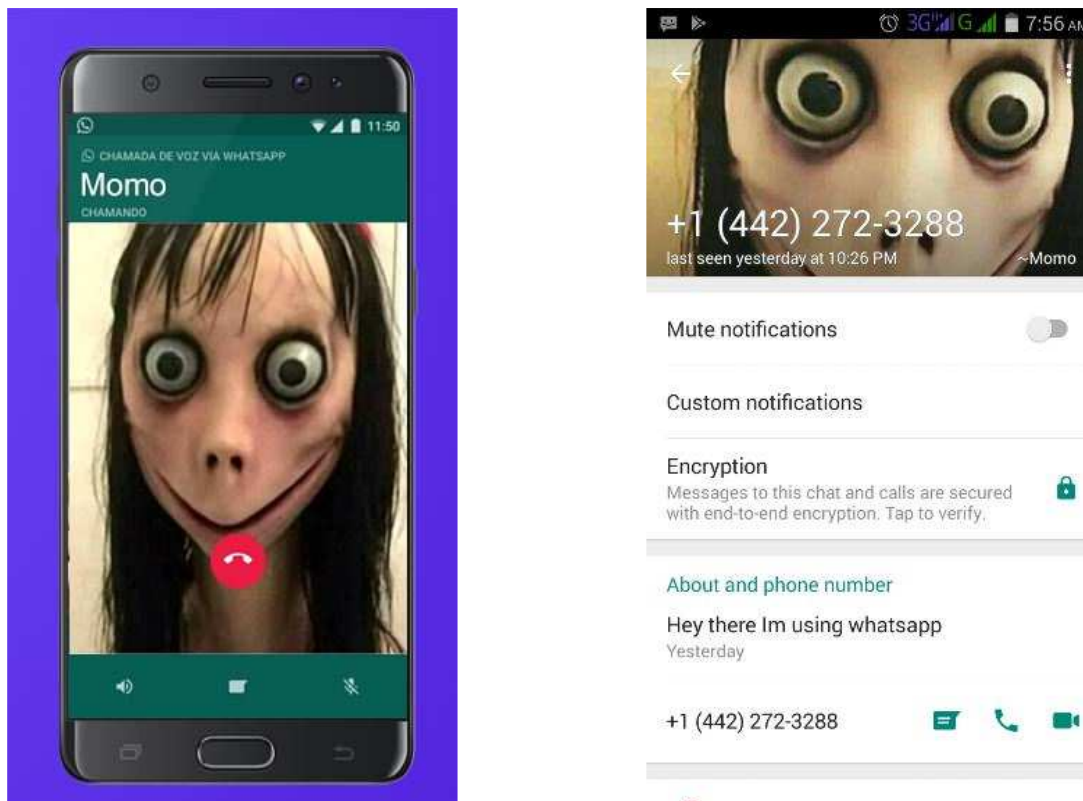
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## 1. WHAT IS Momo?

Today the day to day life begins with mobile phone and 90% of peoples from the world using social media apps such as WhatsApp, Facebook, Twitter, Instagram, etc. Regular chatting and surfing at any place and sharing text, audio, image, video to others. The important of mobile usage now changed to sharing and chatting like video call, online sharing, shopping, etc. Recent days the we receive unknown message with the name of 'Momo' and they tell all the details of your details. So we suddenly shocked and get outdated details. Momo is not a attack and is the person already you known or unknown person creates duplicate account in the name other country person or other county numbers using mobile app and registered mobile OTP access. Normally the human minds set the unknown messages are received from WhatsApp and they shared your all the detail means we afraid and chat with Momo. Momo is not an attack it is private message or individual message from unknown number by your known person.

## 2. SOCIAL CHALLENGE

A recent social engineering scheme has spread across Latin America and could hit the borders of the United States. A WhatsApp contact called, "Momo WhatsApp" was posted on social media sites and has a Japanese area code and a photo displaying a bulging-eyed girl. Claims that interacting with the profile can incite youth suicide through coercion have been circulating around the Internet for days.



**Figure 1: Mo Mo Person details**

The above Figure 1. Shows that the details of Mo Mo and the number represents as other country details

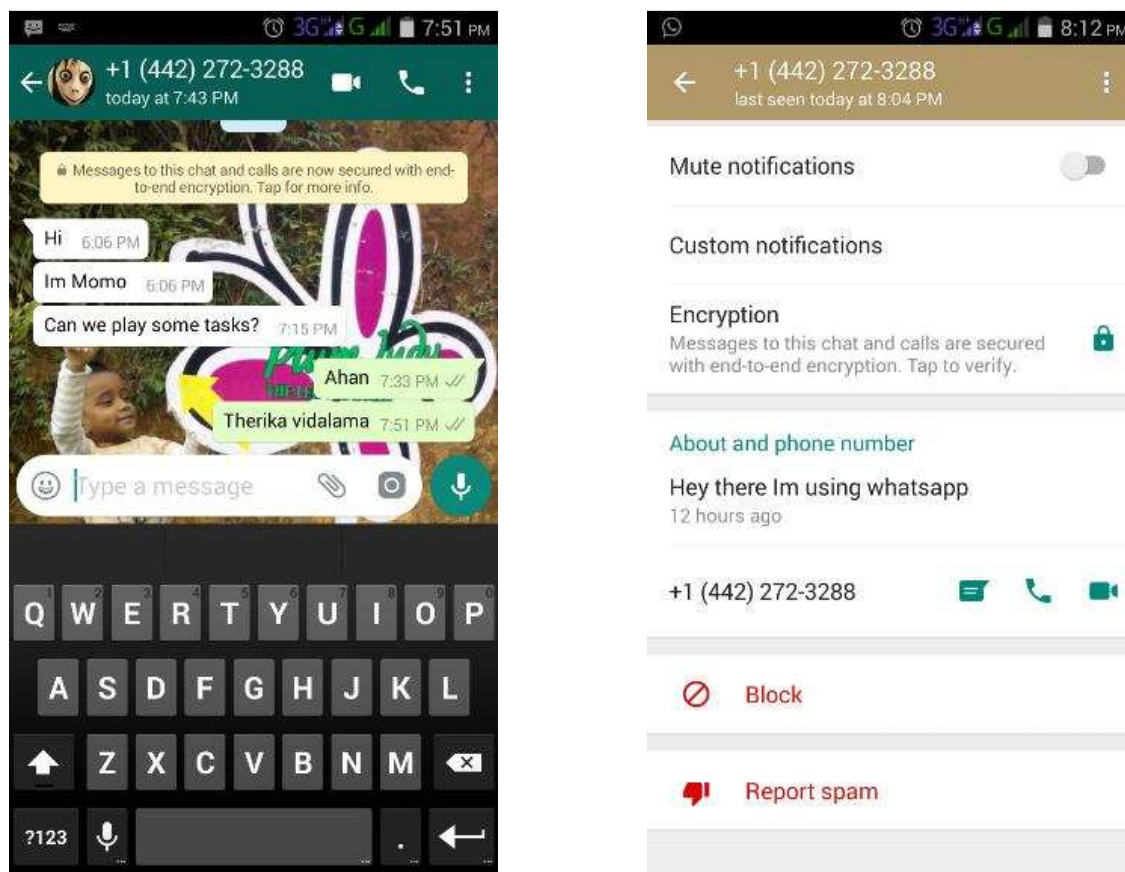
Frightfully, points of interest of the Momo WhatsApp episode reverberate reports of the Blue Whale Challenge that circulated around the web in 2016, which has been bantered as a scam. Logical paranormal examiner, Ben Radford, set that the Blue Whale Challenge is a legend, propagated by the weight on experts to put forth official expressions on gossipy

tidbits. Radford expresses, "Every urban legend have a component of shallow believability about them; that is the reason they are broadly shared and cautioned about."

Everything began as a dim test on a web discussion: who can make the most unnerving paranormal pictures on Photoshop? The test rapidly got on, and soon, a character of unmistakable fear was conceived. An anecdotal character, beyond any doubt, yet positively one sufficiently aggravating to put Stephen King and the Brothers Grimm bankrupt. Our security specialists at dfndr lab added the claimed Momo number to WhatsApp and got no reaction with endeavors at contact. We've verified that few profiles have developed all through the world utilizing this same photograph, so it's unrealistic to state with assurance that the maker of the first contact has made the dangers, or that they even exist. "From the minute this contact wound up viral via web-based networking media destinations, a few terrible performing artists are exploiting the dread and making new profiles to startle individuals, additionally expanding alert and empowering activities that could prompt damage," cautions the chief of dfndr lab, Emilio Simoni.

### 3. MO MO CHAT DETAILS WITH MY CONTACT

I received message from the unknown number to my whatsapp and following are screenshot for chatting information



**Figure 2: First Chat Details and Contact Information**

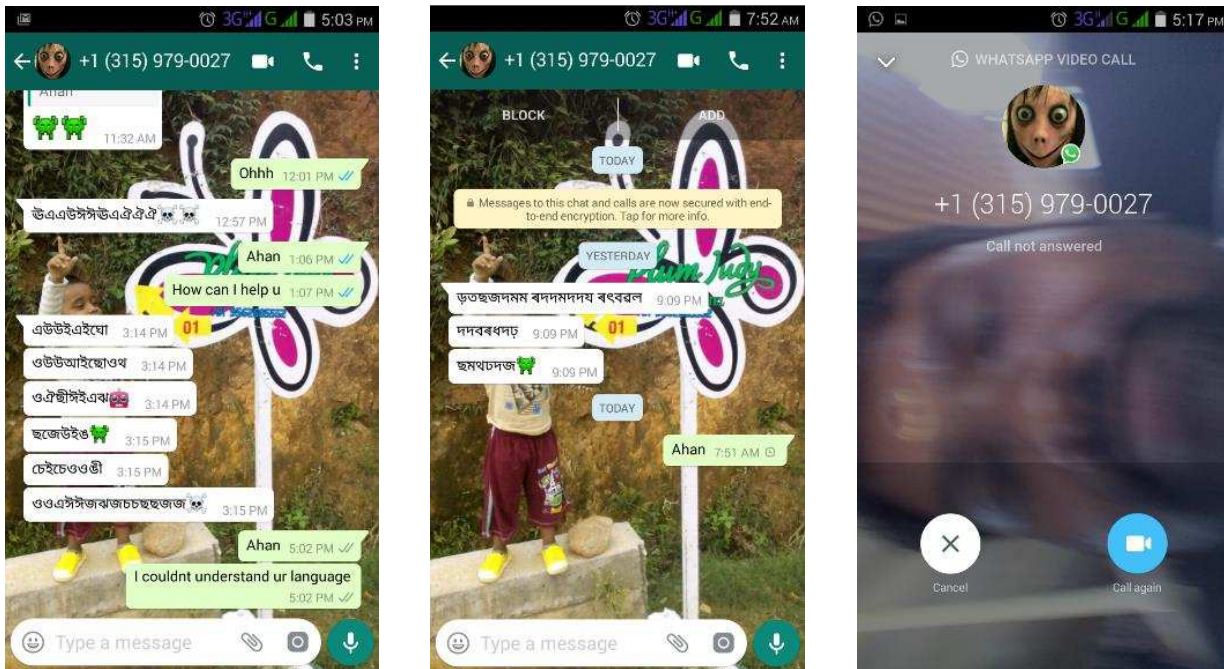
The above figure 2 shows that the first message received from unknown number and I replied as normal chat and verified by using true caller apps it shows information as the unknown number are registered as other than Indian country contest.

1. Keep contact records straightforward. Empower parental controls by securing your kid's contacts list. Guarantee they are not trading data with individuals they don't have the foggiest idea.
2. Focus on interpersonal organizations. Know about what your youngsters are sharing via web-based networking media accounts, particularly their telephone number. Keep in mind that a number can be gotten to and utilized by vindictive individuals.
3. Continuously utilize a decent antivirus. Ensure everybody in the family has antivirus assurance on their telephones, for example, dfndr security, A notice will fly up at whatever point your young person gets a pernicious connection in WhatsApp, SMS, and Facebook Messenger.



#### 4. NEXT STEP

Then the number is altered and received message from other number from different language perceptive



**Figure 3: Mo Mo Message from other number and chat details**

The above figure 3 shows that Momo message contact for other number as different language (Bengali) and registered unknown number as foreign or other country registered number. As the same time I chatted by our language as Tamil and Momo person understand the Tamil language and responded.

The most vulnerable victims to these types of social engineering attacks are young people. Even though the Blue Whale Challenge and Momo WhatsApp could be construed as urban myths, instances of cyberbullying and online harassment are very real. It can now and then be difficult to face your companions, so Childline offers the accompanying tips on the most proficient method to state no:

- 1) Say it with certainty: Be self-assured. It's your decision and you don't need to accomplish something which influences you to feel risky or uncomfortable.
- 2) Try not to judge them: By regarding their decisions, they should regard yours.
- 3) Spend time with companions who can state 'no': It takes certainty and bravery to state no to your companions. Invest time with different companions who likewise aren't taking part.
- 4) Suggest another thing to do: On the off chance that you don't feel good doing what your companions are doing, propose another thing to do.

#### 5. CONCLUSION

As per above discussion and chat the Momo is not attack or game. It is normal contact chat by known person registered by using other country sim card or app. Each and every chat the mentioned as mobile hacked or going to hack your mobile phone. As well as the mentioned all your details in each chat. So the user get confuse and suddenly we get panic. But we must understand Momo is chat based person to know your details and get to panic. In case any doubt or secure your phones you will register two step verification processes with mail to secure and unwanted access your phone details. The conclusion says that Momo is chat by unknown person to get afraid or to create panic to users. My personal opinion shows the Momo is not attack or hacker just chatting my using WhatsApp.

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Currently he is doing PhD in Anna University, Chennai and his research work includes Artificial Intelligence, Network Security, Algorithms and Cloud Computing.

## Popular types of social engineering attacks

1. **Baiting:** Baiting is when an attacker leaves a malware-infected physical device, such as a USB flash drive, in a place it is sure to be found. The finder then picks up the device and loads it onto his or her computer, unintentionally installing the malware.
2. **Phishing:** Phishing is when a malicious party sends a fraudulent email disguised as a legitimate email, often purporting to be from a trusted source. The message is meant to trick the recipient into sharing personal or financial information or clicking on a link that installs malware.
3. **Spear phishing:** Spear phishing is like phishing but tailored for a specific individual or organization.
4. **Vishing:** Vishing is also known as *voice phishing*, and it's the use of social engineering over the phone to gather personal and financial information from the target.
5. **Pretexting:** Pretexting is when one party lies to another to gain access to privileged data. For example, a pretexting scam could involve an attacker who pretends to need personal or financial data in order to confirm the identity of the recipient.
6. **Scareware:** Scareware involves tricking the victim into thinking his computer is infected with malware or has inadvertently downloaded illegal content. The attacker then offers the victim a solution that will fix the bogus problem; in reality, the victim is simply tricked into downloading and installing the attacker's malware.
7. **Water-holing:** A watering hole attack is when the attacker attempts to compromise a specific group of people by infecting websites they are known to visit and trust in order to gain network access.
8. **Diversion theft:** In this type of attack, the social engineers trick a delivery or courier company into going to the wrong pickup or drop-off location, thus intercepting the transaction.
9. **Quid pro quo:** A quid pro quo attack is one in which the social engineer pretends to provide something in exchange for the target's information or assistance. For instance, a hacker calls a selection of random numbers within an organization and pretends to be calling back from tech support. Eventually, the hacker will find someone with a legitimate tech issue who they will then pretend to help. Through this, the hacker can have the target type in the commands to launch malware or can collect password information.
10. **Honey trap:** An attack in which the social engineer pretends to be an attractive person to interact with a person online, fake an online relationship and gather sensitive information through that relationship.
11. **Tailgating:** Tailgating, sometimes called *piggybacking*, is when a hacker walks into a secured building by following someone with an authorized access card. This attack presumes the person with legitimate access to the building is courteous enough to hold the door open for the person behind them, assuming they are allowed to be there.
12. **Rogue:** Rogue security software is a type of malware that tricks targets into paying for the fake removal of malware.

Source & Courtesy: <https://searchsecurity.techtarget.com/definition/social-engineering>

# International Genetically Engineered Machine (iGEM) Competition Language Project

An educational initiative to spread the understanding of Synthetic Biology to the common public

Team iGEM-IIT Madras  
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Language Project is an initiative by students of Department of Biotechnology at Indian Institute of Technology, Madras participating in the International Genetically Engineered Machine Competition 2018 held at Boston, Massachusetts

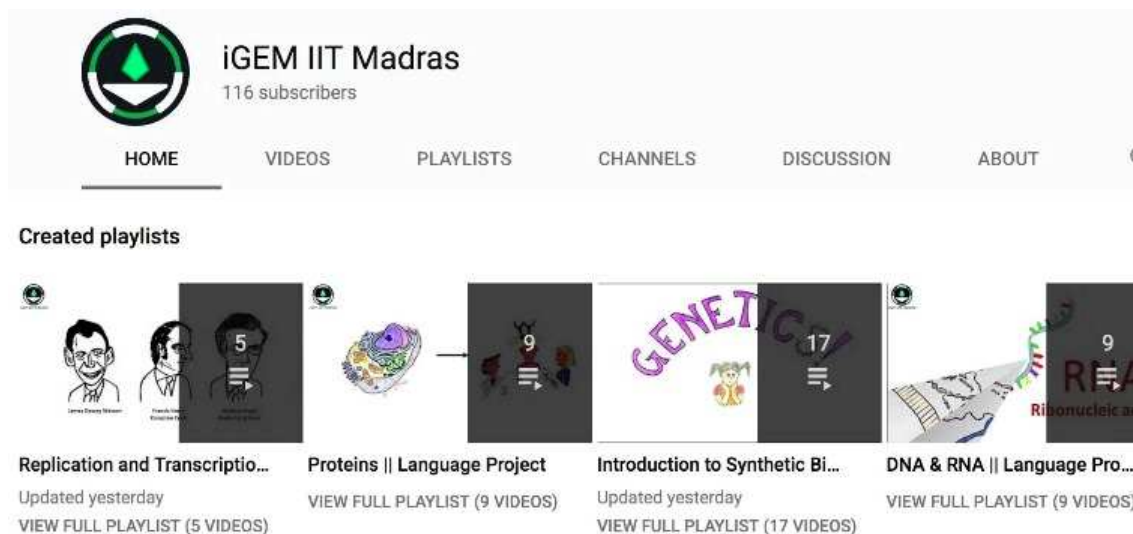
The International Genetically Engineered Machine or 'iGEM' Competition is a worldwide competition in synthetic biology that began in Massachusetts Institute of Technology (MIT) in the year 2004. Within a span of 10 years, it grew from 5 teams to an independent organization in 2012 with more than 200 teams consisting of undergraduate, high school and graduate students. Teams participate in almost 10 different areas of synthetic biology such as Diagnostics, Energy, Environment, Food & Nutrition, Foundational Advance, Information Processing, Manufacturing, New Application and Therapeutics. The basic goal of the organisation is to promote the development of a society of synthetic biologists that aim at open and transparent development of tools to engineer biology for useful applications.

Along with the main research based project that each team works on, they are also required to work on how their research or knowledge can impact the society. This is termed as 'Human Practices' and it forms a key component of the team's judging criteria. While some teams have tried to impact the society with their own scientific research, other teams have educated the people in their country about science, engineering and biology. Some have also attempted into advising the scientific policy making bodies of their countries by creating proposals pertaining to genetic engineering and biology.

Having participated in this competition since 2008, the students from the Department of Biotechnology of Indian Institute of Technology, Madras that form the team known as "Team iGEM-IIT Madras" have won 3 gold medals and 4 silver medals, along with 5 special awards. iGEM-IIT Madras is one of the ten Indian teams participating in the 2018 edition. Last year they got a silver medal for creating a database, called ChassiDex, for quick and easy access to information about microorganisms.

This year as a team of 17 students, 2 Professors, Instructor and advisors, they are working on expanding a genetic toolkit for a microorganism called *Acinetobacter baylyi* which is well-known for its ability to degrade aromatic compounds which are toxic for humans. The team has worked on a number of projects like Antibiotic Resistance and development of tools and systems to aid the study of synthetic biology previously. The team of iGEM-IIT Madras 2008 founded a company called 'Sea6 energy' which is a biofuel company situated in Bangalore inspired by their iGEM project.

With each passing year, students of IIT Madras strive to work on the Human Practices category of iGEM with great enthusiasm. In the year 2013, they received the 'Best Human Practices Asia' award for educating the meat vendors of Chennai about the harmful 'shiga toxins' present in meat. For their participation in 2018, Team iGEM IIT Madras has been working to promote open science and awareness of synthetic biology in general public. So, they have come up with **The Language Project** which is an educational initiative to spread the understanding of Synthetic Biology to the common public.



A screenshot of the YouTube page for the videos

It has been observed that the public does not have a clear purview of the research and findings in biotechnology, so much so that a basic know-how of genetics is also not common and the brunt of the decisions in public domain falls into the hands of lobbyists for example, GMOs. Hence, they have begun to make and spread content about the basics of biotech in a commoner's language. The content is now available in different languages namely Kannada, Tamil, Telugu, Marathi, Hindi, Bengali, Malayalam, Gujarati, Assamese and English on the YouTube channel for viewing. Each video consists of hand drawn images along with subtitles in English. As this initiative grew more popular, it has attracted the attention of iGEM teams outside of India as well. They have contributed by translating the content of the video into their common language. With the growing amount of collaborations, iGEM-IIT Madras has now released videos in international languages like French, Mandarin, Malay, Spanish, Bosnian, Arabic, Catalan and Chinese.



Team iGEM IIT Madras Language Project : Tamil Intro to Synthetic Biology

*A glimpse of the 'Introduction to Synthetic biology' video in Tamil*

The videos have been split into a series with Chapter 1 giving an Introduction to Synthetic Biology, Chapter 2 explaining DNA and RNA, Chapter 3 explaining fundamentals of Proteins and Chapter 4 talking about a the basic phenomenon of Replication and Transcription. They are continuing work on the remaining 4 chapters in the series in the hope of equipping a commoner with the complete knowledge of Synthetic Biology to make knowledgeable decisions on GMOs, etc. Currently, they have received valuable feedback after showing these videos to their family members and friends. Further, they have received a lot of attention due to the rising popularity on twitter after posting these videos. Recently, they received valuable insights about The Language Project from the alumni of their university in an event at the Leela Palace in Chennai. In the future, they hope to contact school that teach basic sciences in regional languages to show the students their videos.

iGEM competition has become the primary driver in undergraduate research at the Department of Biotechnology, IIT Madras and consists of students from all academic years. This has strongly inspired the students in the team to pursue an academic career in the future. Synthetic biology has world-changing applications, which can affect human life and this planet for good, and the team wishes to be at the forefront of innovation and technology through this competition.



*Picture of the team for 2018*

*From left to right: Mousami, Shreya Nema, Karthik, Sahana, Sathvik, Vaibhavi, Sarvesh, Sankalpa, Srinath, Aniket, Sai Guha, Sagarika, Roshni, Nikhita, Burhan, Faidh, Dr. Nitish Mahapatra, Dr. Guhan Jayaraman and Kailash*

This article has been contributed by the Team iGEM, IIT Madras. For more details, pl. contact Ms. Nikhita Damaraju, 4th year UG, Dept. of Biotechnology, IIT Madras at [igem@smail.iitm.ac.in](mailto:igem@smail.iitm.ac.in)

## Understanding Waste Management – Part 3

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### Air Pollution

#### Introduction to Air Pollution

While in popular terminology "air" is often conflated with "oxygen," air actually consists of oxygen and a mixture of other gases, such as nitrogen (which makes approx. 79% of air), carbon dioxide and rare gases, and methane etc. In fact, every breath you take for example contains methane, a gas that could kill you if you breathe too much of it. In addition to supplying the oxygen you need to survive, air is an important part of several essential cycles that also make life on Earth possible.

Imagine not being able to hear a screaming jet engine a foot away from your ear. That's what would happen if air did not exist. People can hear sound only because air carries sound waves from one point to another.

Earth's atmosphere helps protect you from X-rays, cosmic rays and other particles that bombard the planet. Earth's ozone layer helps reduce the amount of harmful ultraviolet radiation that reaches the surface. Air also reduces the possibility that meteorites and asteroids could level a city. Most space rocks vaporize in the air before they reach the ground, where they can cause destruction. Earth's atmosphere also helps moderate temperatures so that its surface isn't too hot or too cold to support life.

Without air, average temperatures on Earth would plummet to below freezing. During the day, the planet gets warm as it absorbs energy from the sun. Through a process called the greenhouse effect, carbon dioxide and other greenhouse gases absorb some of the infrared radiation the earth releases as it cools. This heat in the atmosphere causes the earth's surface to warm as well.

#### What is Air Pollution

**Air pollution** can be defined as the presence of toxic chemicals or compounds (including those of biological origin) in the air, at levels that pose a health risk. In an even broader sense, air pollution means the presence of chemicals or compounds in the air which are usually not present and which lower the quality of the air or cause detrimental changes to the quality of life (such as the damaging of the ozone layer or causing global warming).

Air pollution is probably one of the most serious environmental problems confronting our civilization today. Most often, it is caused by human activities such as mining, construction, transportation, industrial work, agriculture, smelting, etc. However, natural processes such as volcanic eruptions and wildfires may also pollute the air, but their occurrence is rare and they usually have a local effect, unlike human activities that are ubiquitous causes of air pollution and contribute to the global pollution of the air every single day.

The chemical compounds that lower the air quality are usually referred to as air pollutants. These compounds may be found in the air in two major forms:

1. in a gaseous form (as gases),
2. In a solid form (as particulate matter suspended in the air).

#### Present day scenario

According to the Indian scenario 11 of the 12 cities with the highest levels are located there. Kanpur, India, population 3 million, tops the list with a yearly average of 319 micrograms per cubic meter of PM2.5, the most hazardous particle commonly measured.

The WHO doesn't treat its data as a ranking but rather a measurement of where risks are. But it's clear from the report that India is one of the riskiest countries in the world to breathe, up there with Bangladesh and Georgia. When it comes to comparing PM10 measurements of the world's largest cities, India's capital Delhi comes in with an annual average of 292, ahead of Cairo (284), Dhaka (147), Mumbai (104), and Beijing (92), the Washington Post noted.

Frequent unhealthy levels of pollution from sources ranging from vehicles to the burning of coal and wood for cooking, dust storms, or forest fires affect most of the country. India's hills and mountains also act as basins that trap toxic air over vast swaths of the country, sometimes making the air too dangerous to breathe.

Delhi, India's capital region, home to nearly 19 million people, is notorious for choking air that is now turning the iconic white marble walls of the Taj Mahal green.

Two-thirds of India's population still lives outside of cities, and 80 percent of these households rely on biomass like wood and dung for cooking and heating. Agricultural practices like burning crop stubble also remain widespread.

This smoke can then waft over major cities such as Chennai and Mumbai, where it commingles with traffic exhaust, factory emissions, and construction dust. It can also get trapped by inland by features like hills and mountains, leaving few areas in the country where Indians can breathe easy.

### **The Effects of Air Pollution on Human Health**

Air pollution has serious effects on the human health. Depending on the level of exposure and the type of pollutant inhaled, these effects can vary, ranging from simple symptoms like coughing and the irritation of the respiratory tract to acute conditions like asthma and chronic lung diseases. Long-term exposure to particulate matter, sulphur dioxide, and nitrogen dioxide led to cognitive declines in study participants as they aged. Less-educated men were particularly impacted and had low verbal and math test scores.

Previous studies have found that female brains on average have more white matter than male brains, meaning damage to white matter would put males, with lesser white matter, more at risk of experiencing cognitive declines.

All of the blood that leaves the lungs goes through the heart, where it's then pumped out to the rest of the body. Costa suspects this triggers the immune system, causing inflammation. Over time, he says, too many toxic particles could cause too much inflammation, which may accelerate how quickly the brain ages.

Costa, who until recently worked at the U.S. Environmental Protection agency, says particulate matter, which is generated by anything from wild residue to fossil fuel combustion, is largely thought to be the air pollutant most dangerous to health. But pinpointing the impacts of any one particle can be difficult because regions with poor air quality often have more than one type of pollutant.

### **Methods to prevent / reduce air pollution**

With increase in economic and industrial activity, the pollutant discharge in the air is also increasing. To reduce this flow of pollutants into the air, certain engineering and technological measures are prevalent and effective nowadays. Some of the common ones are briefly mentioned below:

1. An **electrostatic precipitator (ESP)** is a filtration device that removes fine particles, like dust and smoke, from a flowing gas using the force of an induced electrostatic charge minimally impeding the flow of gases through the unit.
2. A **baghouse**, bag filter or fabric filter is an air pollution control device and dust collector that removes particulates out of air or gas released from commercial processes or combustion for electricity generation. Power plants, steel mills, pharmaceutical producers, food manufacturers, chemical producers and other industrial companies often use baghouses to control emission of air pollutants. Functioning baghouses typically have a particulate collection efficiency of 99% or better, even when particle size is very small.
3. A **cyclonic separation** is a method of removing particulates from an air, gas or liquid stream, without the use of filters, through vortex separation. Rotational effects and gravity are used to separate mixtures of solids and fluids. The method can also be used to separate fine droplets of liquid from a gaseous stream.
4. **Wet scrubber** is a control device depends on the industrial process conditions and the nature of the air pollutants involved. Inlet gas characteristics and dust properties (if particles are present) are of primary importance. Scrubbers can be designed to collect particulate matter and/or gaseous pollutants.
5. **Dry scrubber**: The dry and semi-dry systems usually consist of a reaction area with additive supply, possibly a conditioning phase (as in the semi-dry method) and a dust collector (ESP, fabric filter).

### **Future Focus & Scenario**

As the human population and its associated economic activity is increasing rapidly, Air is also becoming a precious resource which is under pressure. As air is essential to sustaining biological life on the earth, it's a serious challenge to the civilisation.

Various technology and engineering initiatives are in progress throughout the world to ensure that air quality is protected. These include emphasis of use of solar and wind energy to generate electricity, developing mass system for transport etc which will reduce dependence on fossil fuels.

This is a wide topic and will require many articles to describe the various developments , hence we limit our description here.

*Bye till the next issue.*

## Start-ups – Founders Cardinal Rules

**Dr. L. S. Subramanian**  
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I have had the opportunity to interact with Founders of Start-ups in various stages of evolution and it surprises me that most Founders do not have a clear set of rules for their business. Many Founders seem to be living a dream far removed from the reality of running a start-up business.

Here are some cardinal rules for Founders:

**Rule 1 - Founders will hire experts when required, rather than a DIY approach:** Founders may be experts in their domain, but you cannot be an expert in every domain required to build a successful business. They must hire leaders for roles where they do not have the expertise for example the role of CFO, CMO, and HR. It is important for Founders to have right leadership in the organization to ensure success of the start-up.

**Rule 2 - Customers will always pay for services and so will Founders:** There are no free lunches for Founders or their customers, both are at risk by offering or receiving free services. Many established business encourage start-ups to provide free services by enticing them with good recommendations for their services, which may never happen. Many fall into this trap. Founders rule must be Customers will always pay for our services and so will Founders.

**Rule 3 - Founders will work on increasing the transaction value and customer base:** Founders will strive to build transaction value and customer base, volume of business growth is important for a success of a start-up, if Founders do not focus on accelerating their business growth they will never reach their destination and another Founders vision will end in a shattered closure.

**Rule 4 - Founders are in Business for Profits and not for Charity (free services):** Founders must realize the start-up is in business, and business is about profits, sustainability, and growth. Start-ups are not in the business of charity by providing free services to established business for referrals and experience, neither the start-up of the customer benefits by these charitable services. Founders stay away from Companies that do not value your services.

**Rule 5 - Founders will use their network to grow their business:** Networking is the key to business growth and it is important for a start-up, the more people you meet as the Founder the better for your business. You are able to validate your ideas, present it in various forums and even acquire customers by networking. As a Founder remember, Networking is an important ingredient for a start-ups success.

**Rule 6 - Founders will have a clear strategy supported by realistic financial goals and exit valuation:** We have many Founders who refuse to sell when there are many suitors; the founder is waiting for someone to give the correct price for the business. Founders need to realize that they should leave some money on the table for the buyers of their business. Founders must have clear financial goals when they begin the journey as start-up, yes, you will make the world a better world but they should also remember money makes the world go around.

**Rule 7 - Founders invest in good mentors to guide them in their business:** Good mentors are a valuable asset for Founders; make sure you find Mentors who can stand with you through thick and thin as you take your start-up through good times and bad times. Mentors are like an anchor and help Founders sail through turbulence so that they reach the shore safely.

**Rule 8 - Founders cannot change the world, though they can make it a better place:** Founders need to remember that they cannot change the world, you are not Atlas, even if you believe you are Atlas all you can do is shrug. However, as a Founder you can definitely make the world a better place by creating wealth and sharing it with people who make your start-up a reality. Founders must contribute to make the world a better place, but their primary focus will be to build a successful start-up.

**Rule 9 - Founders will operate with all leadership roles in the team (full time/part time):** Founders will need to share the leadership responsibility; they need to hire resources for the roles where they do not have the experience. Founders must budget the cost of hiring good resources in your financial plan, attracting good talent for a start-up could be a challenge but it is important to hire leaders who share the Founders vision.

**Rule 10 - Founders whose business is not profitable will sell out or close out:** Founder's must be focused on their financials, many a Founder is on a perpetual high after cutting the apron strings with the old employer. Remember Capital is a scarce commodity and unfortunately runs out faster than you can collect Revenue; hence prudent founders must ensure

the business is profitable will be the winners. Founders who cannot make profits must consider the options of selling, closing or venturing into another line of business, which may have better potential for profits.



**About the author:** Dr. L.S. Subramanian is a Technology Adviser, CXO and thought leader with expertise in Networks, Infrastructure, IT Security, Compliance, Cloud Computing and Emerging Technologies. He has 30 years' experience in framing the technology agenda for organizations therein advising them on the changing Information Technology ecosystem and its usage within organizations. His Business Domain interests include: Banking & Insurance, Retail, Exchanges, Government, Manufacturing, Financial Services, IT & IS Services. He is a specialist in CXO Advisory, Emerging Technologies, Cloud Computing, IT Strategy & Architecture, Networks and Infrastructure, Data Centers, IT Systems and Vendor Selection, Project Management, Information Security. He has worked in various geographies such as India, United Arab Emirates, Australia, United Kingdom, South Africa, Singapore.

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## Work Practices To Make The Best Of Your Time

The following is the "To-Do" list for the new folks at CDAC Mumbai.

*prepared by*

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### Commitment to work

- Writing Java/.Net code is not the only sacred thing in life; every component in SDLC is equally important. Increasingly, coding is the least sacred thing!
- Getting to associate with a project through its life-cycle is a rare privilege! Never say "no".
- Own the project you are in – go beyond the assigned space.

### Involvement in Centre's activities – small and large.

- Get involved in some teaching activities. Start with lab, and then move to lectures. Teaching is a great learning and personality development aid.
- Hindi promotion
- Swachh Bharat Abhiyaan

### Respect work ethics and rules and regulations.

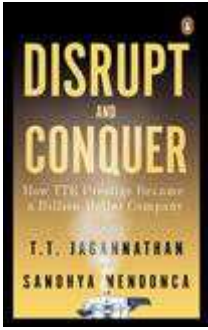
- Respect everyone and their time, irrespective of their level or profile.
- Everything is a learning opportunity, for those who are prepared. Everything and everyone around you have something to teach you; listen carefully, not to miss it.
- If you are underutilised, inform FLA, and further. No point in throwing up hands, at the review time.
- Note that we have recruited you and are paying your salary, for us to get our work done. Not to build your CV!
- We usually have very little person-level monitoring; that is not 'don't care'. It is 'we trust you to be responsible'. Violations can be costly.
- Not much of dress code. But dress without embarrassing others!
- Use APAR as a self-assessment device; it helps to be objective, and make the exercise productive.

### Excel in something

- Technologies change rapidly with time. Be flexible to adapt. Don't hand over your life to Java or .Net or whatever.
- Build expertise (deep knowledge) in some subject – try to be the "best" in the field. It may define your life for you.
- We have a good library. Do visit sometimes. Lot of good resources; explore.
- Read at least one non-fiction book every year, cover to cover.



## The Karma of Business



*Excerpts from the chapter 10 of the book*

**Disrupt and Conquer: How TTK Prestige Became a Billion-Dollar Business**

By T T K Jagannathan & Sandhya Mendonca

2018 / 232 Pages / Hardbound: Rs. 599 / ISBN13 9780670090174 / Penguin Random House India / Penguin Portfolio

*It is the karma of a businessman to run a successful business.*

Do I consider myself a lucky person? Yes and no. When Napoleon wanted to pick one of five generals to lead a battle, his advisers suggested the names of those who had won previous wars. Napoleon said, 'Tell me who is the luckiest. That's whom I want.' You need to have luck, and, fortunately, I have had it.

Let me give you some examples of luck. Paytm, the electronic payment company, was struggling for six years until the government demonetized the rupee in 2016. Paytm's business has now grown to such an extent that *Time* magazine listed its founder, Vijay Shekhar Sharma, on the 2017 *Time* 100, the publication's annual list of the 100 most influential people in the world. Is that luck or isn't that luck?

Similarly, Sunil Bharti Mittal, whom I used to know very well, got lucky. He was in the right place and at the right time. We were both in manufacturing. I was making pressure cookers, while he was making landline telephones. He started by making a telephone called Beetel in Ludhiana, which was not a very big product. When the government opened up the telecom industry and invited applications for licences, he moved from manufacturing to telecom services. He didn't invent the mobile phone, but by moving from manufacturing to providing mobile telephone services, he grew Bharti Airtel into a global telecommunications company. That's great timing.

On the other hand, there was a phone manufacturer here in Bangalore who was even bigger than Beetel and had a Swedish collaboration. This company died because it was just making landline telephones and could not survive in the world of mobile telephony.

### A different kind of luck

I didn't have the kind of luck that Sharma and Mittal did, but I have had luck of a different kind, which has included a combination of logic, blessings and self-belief.

I had luck in the sense that I followed logic and did the right things accordingly. Now, that doesn't necessarily lead to success. If luck is not with you, everything can fail.

The most important factor in my success was my parents' blessings. My father supported all my decisions. If I felt depressed, I would go talk to my mother and she would say, 'You will pull it around, Jaggu. Don't worry. I know you will pull it around.' The blessings of my parents have seen me through.

When Hanuman was entrusted with the task of finding Sita, he wondered how he would make it across the sea to Lanka. Jambavan told him, 'You don't know this, but if you leap, you can cross the sea.' Similarly, my mother used to tell me constantly, 'You can do it,' and I was able to do what I did.

### God and karma

Somebody once asked me if I was a spiritual person. I find it hard to define the word 'spiritual'. I believe in God. I am not a great one for rituals, pujas and *homams*, but I certainly believe in God and I believe in the theory of karma. Somewhere, karma kicks in.

I rationalize that, good or not, everything happens because of it. Karma is what you have done; it can't be changed but it can be mitigated by doing good things. I don't particularly do any good things because I don't do any bad things. In our religion we don't have tombstones, but if I were to have one I would like it to read, 'He didn't harm anyone.' That's all. I won't claim that I have done a lot of good, but I have employed 20,000 people and have never renege on paying their salary, not even for a day. That's my share of good.

I think that it is the karma of the businessman to run a successful business. Except that I am an accidental businessman.

## Patience

I am an extrovert and I like people, but I am not always cheerful. As a Gemini, I have two facets to my personality. When disaster strikes I get depressed. I go into a shell and start thinking about how to solve the problem. I go home and don't speak to anybody. I watch TV and play cards while trying to figure out a solution. I play two hours of Patience every day, I play for an hour in the morning before I read the newspaper, and for another hour in the evening. I play ten different kinds of solitaire.

I enjoy playing Blackjack and have had memorable wins at casinos. My final paper in Cornell in probability theory was on Blackjack. After the exams I went to Las Vegas and won a ton of money playing Blackjack. Another time, when we were holidaying with a group of friends and families, all our money was stolen at the airport in Nairobi. Those were the days before credit cards, and all we had was mostly cash. I went to a casino and won a handsome amount.

## Never accept defeat

I never accept defeat, be it in business or in a sport. This is what spurred me to take up golf. I had once accompanied a very close friend, Dr Srimurthy, to the golf course in Ooty. He is a very good player, and when I walked along with him for three holes, I said, 'This is very easy. Give me one of those sticks, I can also play this game.' It was heresy. I put the ball on the ground but I couldn't even touch it, though I took ten shots at it. I was very irritated that I could not hit a stationary ball, and it had no spin or googly, unlike a cricket ball.

I was taken aback as sports came naturally to me. I had played tennis for India as a junior. We had a tennis court at home, and I had started to play when I was ten. When I was fifteen, my contemporaries were Vijay Amritraj, who is three years younger than me, and Anand Amritraj, who is a year younger than me. The three of us had the same coach, Ramarao. I was playing very good tennis until the coach changed my grip from my natural flat hand to the shake hand that was popular those days. I could not get used to the new grip and my game was destroyed. I did not play at the professional level after that, though I captained the tennis team at IIT. Today, ironically, everybody plays with my grip, but that's how life can be sometimes.

I could not accept my inability to play golf and decided that I had to learn to play this game. I became a corporate member of the Bangalore Golf Club, bought a set of clubs and started playing by myself. I refused coaching and developed a very unorthodox style. But I enjoyed the game and used to play two rounds nearly every day of the week. It has been five years since I played, though, as I have fibrosis of the lung, which makes it difficult to walk for long. I had taken up golf thinking I could play it until I was ninety. In recent years, I have switched to my old passion, bridge. I play bridge three times a week, mostly at tournaments in various clubs in Bangalore.

## Three simple rules of business

I don't go around giving lectures or advice. I refuse invitations to address management students, but now seems like a good time to say a few words about my learnings in running a business. I would not venture to advise anyone setting up a business today about the nature of their business. Today's conditions are so different. Every start-up is digitally based, and I belong to old business. But the rules of running a business would be the same.

It's good to have an MBA, but you don't need a business degree to run a business. After all, the MBA is a recent phenomenon. Vanderbilt, Rockefeller, Carnegie, Kennedy, J.P. Morgan—none of them had an MBA degree. If you take a look at the founders of Flipkart, Big Bazaar, Ola—none of them are MBAs either, and they have done a great job.

I have three simple rules for running a business:

1. Get down to the office every day.
2. Look at the details. Don't see the big picture, look at the small picture. The big picture will look after itself.
3. Apply your common sense, and not just what you read in textbooks.

It's important that you get to work every day and you look at the details, because it's in the detail where you lose money. You only have to look at our business to see how things can go wrong if one looks only at the big picture. My father started businesses that were great. The big picture was fantastic, it was in the detail that it went wrong and in the way everything was executed.

You need acumen and a lot of common sense. You must not be afraid to apply your common sense. It's largely the elementary things that work. When I came up with the GRS for the pressure cooker, all I invented was just a hole in the lid. But the company would have gone bankrupt if not for that hole in the lid. All it took was common sense to fix the problem.

Get to work every day, look at the details, and use a lot of common sense, the most uncommon trait of all.

## A legacy

These rules have helped me put the TTK Group and all the businesses in the conglomerate on a sound footing.

They have helped me steer our flagship TTK Prestige's growth from a single factory to five factories, twenty-three warehouses, multiple innovation centres and a network of 50,000 retailers across India. We have an international presence through supplies to Original Equipment Manufacturers (OEMs) in the UK, Europe, US, west Asia, Africa, south-east Asia, Australia and New Zealand.

In 2003, TTK Prestige was worth about Rs 100 crore; in 2013, it was worth Rs 1300 crore. We became one of the most admired companies in the stock market too. Our share price initially shot up to Rs 4000 and then continued to rise. It has been averaging over Rs 6500 this year (April 2017 onwards) and at times, nearing Rs 8000. The company's market capital now exceeds Rs 8000 crore. These numbers power our growth and motivate us to keep innovating and expanding.

We are now the number one brand in both pressure cookers and cookware. We are the only Indian company to offer the complete induction-cooking solution. We are also the number one brand in value-added gas stoves, and we are India's largest kitchen appliance company. What is gratifying is my certainty that you will find a Prestige product in each of the nearly 300 million households in India.

Had I started my journey as a businessman with zero capital, I would have been ten times richer than I am now, but I began with a colossal deficit. There has never been a dull moment on this journey. I fulfilled my father's desire to pay off the Group's debts, built a sound foundation for the business that has been in the family for three generations, and I am leaving it in the secure hands of professionals. I have enjoyed the risks I took and the disruptions I caused along the way. This is the true measure of my success as I get ready to hang up my boots.



The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. The goals are interconnected – often the key to success on one will involve tackling issues more commonly associated with another.

## Leading Science and Technology: Vision for the Future

*The following excerpts are the second part of the chapter 10.  
The first part dealing with "Sixteen Principles for Building a Highly Effective Research Ecosystem"  
was published in the Apr-Jun 2018 issue of ICNL.*



*Excerpts from the chapter 10 of the book*

### **Leading Science and Technology: India Next?**

by

Varun Aggarwal, Co-founder, Aspiring Minds

2018 / 312 pages / Paperback: Rs 595 (9789352805082) / SAGE India

#### **What India Needs to Do?**

Let us move from the abstract to the concrete. What can India do to invigorate our research ecosystem? The government has taken several measures in the last few years. However, most of these have been "Band-Aid" solutions to fix bad policy rather than an attempt at structural change. What structural and policy changes would be actually helpful, at a national and institutional level? Let us discuss these now.

#### **Focus on Universities as Places for Research**

In India, four times as many researchers work in government research labs as in university labs. This contrasts poorly with countries that demonstrate the highest research output (refer Chapter 9). The world discovered long ago that productivity increases when faculty and students, together, take the lead in research work. The university-based research model creates high-quality research training and a continuous flow of new researchers.

The Indian government needs to promote universities as the place to do research. A larger part of the current research budget should go to universities. A thorough audit of government laboratories will help identify where funding can be reduced and redirected. Labs that perform well can be retained and aided in growth. Those that are underperforming or engaged in obsolete areas can be phased out in due course. The government had good success in reforming the PSU sector. They have been reformed, prodded to become profitable, and some were divested or even shut down. A similar campaign can help our research sector as well.

We must also encourage university/government partnerships. There is much potential for government labs with strategic goals such as DRDO and ISRO to interact with university personnel and embark on collaborative research projects for mutual benefit. We see models for such collaboration in DARPA and NASA, which offer funding in various problem areas through calls for proposals.

#### **Make Institutions Autonomous, Independent, and Accountable**

Government can also be helpful by allowing our research institutions greater freedom to make their own decisions. Government should not dictate how they should spend their money, how much to pay their personnel, how to manage promotions, and how or when to scale up. The research institutions and academics who are directly impacted by these decisions are best able to decide them. Furthermore, political interference on appointments and decision-making, besides being unhealthy and inefficient, goes beyond even the current ruling public charter. Such interference and micromanagement is demoralizing and deters the best people from entering the university system to pursue academic careers. This must stop.

With autonomy comes accountability. Our universities must justify their public funding against clear performance metrics. Public universities should be required to compete with each other for resource allocation. Such an approach to funding will help them improve themselves.

Autonomy begins with the governing board. The boards of public universities should be independent, choose their own chair-person, and decide the leader of the universities. Given that the universities are supported by public funds, government representation is proper. However, this representation should be a limited number of members, including both the central and state governments. The board should be primarily concerned with the institution's progress. They should be free to deliberate independently, balancing the views of all interested parties including the government, to steer the university along the correct path.

Consider a recent example from the University of California, San Diego. In 2012, the board appointed Pradeep Khosla as chancellor with a base salary incrementally larger than the salary paid to the previous chancellor. Gavin Newsom, California's lieutenant governor and the government's representative on the board, was the lone dissenter. However, the

board overrode his dissent, citing Khosla's "proven background in fundraising and bringing in research dollars.... Chancellors make a difference, we have to recognize that." Furthermore, the board explained that the additional salary would be mostly covered by foundation money and not by taxpayer money. India's institutions would benefit from such freedom to make decisions without fear of government objection or reprisal.

Second, the boards have power over academic and administrative issues, but not financial issues. The government and the IIT Council makes all decisions on capital investment, salary guidelines, fee structures, and other such matters. Financial autonomy is key to making our institutions world class. Again, autonomy can be supplemented and buttressed by accountability. The government should set certain performance benchmarks in proportion to the funds provided. Accountability should start at the leadership and flow to every faculty member in the institute. The disbursal of future funds must depend on how well these metrics are satisfied. The government has already instituted a similar arrangement with the PSUs, where funds and autonomy are set in proportion to performance.

Overall, university finances should be run in a more businesslike manner, with line items detailing the profit/loss of various university operations. Instead of the present flat grant system, a more sophisticated accounting system will reveal what the government is really subsidizing: is it undergraduate teaching, scaling research, postgraduate programs? When each component is examined individually, the government can deliberate and decide what they want to subsidize and where they want to invest. In turn, this will force the institutions to examine their operations and programs more critically. They may even price their courses and programs differently for the public, creating a market.

These things cannot happen overnight. Until now, our universities have had little experience managing their own finances, making businesslike decisions, and performing research administration. The drive for autonomy will be pushed back by decades if the universities mismanage themselves to the point where the government has to bail them out. Before we can hand over significant autonomy, we need to establish the right management structures and conduct proper training for administrative personnel. In my opinion, we should seek training collaborations with top universities abroad. Training partnerships with institutions in the West and in South Asia will give our administrators a holistic experience. When Hong Kong University of Science and Technology (HKUST) was starting up, the governor insisted that the university head should be president of a top Western university. I do not think that we should set such preconditions for our leaders, but rather select the best person for the job whether in India or abroad.

India liberalized its economy in stages, allowing the market to react harmoniously. We should follow a similar path with our universities: limited autonomy leading eventually to full autonomy. Limited autonomy could mean approving budgets for different line items in the financial statement and adhering to particular overall performance benchmarks rather than analyzing every spending decision. Limited autonomy could also mean more flexible salary bands, rather than the narrow ranges dictated by the pay commission.

The government should treat the liberalization of university system with priority similar to that it gave to economic liberalization. We need a great team to do it. As the government pursues limited autonomy, they must resist the temptation to make it a goal rather than an end. The divestiture of power should be the guiding principle, with full autonomy as the ultimate goal. We need to plan for the future.

Our private universities require more autonomy as well. However, accountability is tricky in their case (see "Autonomy and Accountability at Private Universities").

### **Autonomy and Accountability at Private Universities**

The Indian government also exercises control over private universities and institutions. The government places various restrictions on the programs they can run, the salaries they can award, the number of students they can admit, and the fees they can charge. There are also regulations on infrastructure—the amount of land and property required, and the kind of laboratories and classrooms. These regulations are not always optimal. Different institutions have different strengths and weaknesses, and should enjoy the freedom to make different trade-off choices based on their mission.

Besides, these regulations create space for corruption in regulatory bodies. Regulatory entities have often been accused of bad behavior. It is unclear whether government regulations have actually improved quality or if they have simply created an industry of higher education entrepreneurs who know how to lobby government agencies and bend the rules. These conditions dissuade able and well-meaning individuals from establishing new educational institutions because they do not want to deal with a corrupt system.

We might be tempted to think that we can solve this problem with the same remedy we prescribe for public institutions: autonomy and accountability. However, accountability is tricky in the case of private schools. Ultimately, they are only accountable to the students and parents who are their customers. In an ideal market system, poor performance would lead to loss of customer interest, fewer applicants, and declining revenues.

Education is not a perfect market entity, however. Consumers cannot easily distinguish between good and bad. We do not have objective measurable parameters for comparing institutions. Many universities make up numbers and facts on student placements, number of faculty, faculty qualifications, and collaborations. Others use showmanship and optics that have nothing to do with education or research: marble flooring, chandeliers, celebrity endorsements, and even foreign-accented teachers in advertisements! Consumers are often swayed by such gimmicks—especially the first-generation learners. Therefore, accountability is really difficult.

I believe the solution lies in creating a credible rating system for these educational institutions and widely disseminating the results to the public. The market itself cannot create healthy competition or control the quality of our universities and colleges. Government should not itself run the ratings system, but should create a market of credible rating agencies. The big four consulting companies, education research, and think tanks are natural candidates. The government has already done a similar exercise in credit ratings, establishing approved agencies among which companies and banks may choose their preference.

Once established, the government should mandate that all institutions—public and private—must go through the rating process. They should take it upon themselves to ensure that the school ratings are widely disseminated among the public, through newspaper publication and Internet websites. As the public becomes more aware of which factors indicate institution quality, we can begin to remove direct government oversight and regulation. The best processes for achieving this, and the measurements of effectiveness, would constitute a research project in itself!

### **Identify Areas for Excellence**

No nation, institution, or person can do well in all research areas. Each entity operates according to their talent and comparative advantage. India can share in this world by identifying research areas in which to excel. Three principles can help identify these areas. First, we need only consider our natural strengths. Because we already have a large IT industry ecosystem, computer science is a natural point of concentration. In fact, computer science should be a research priority if we wish to preserve our edge—the dulling of which has already begun to show. Additionally, our demonstrated success in space research raises the opportunity to specialize in world-class instrumentation and equipment produced at a lower cost.

Second, we need to invest in new and emerging fields that show promise and potential to drive the next generation of innovation. Data science and AI are two such fields that have recently seen disruption. Given our IT industry combined with the aptitude of our citizens for computers and numbers, India could share in these fields. I also find that India has an aptitude for the quick and economical collection of data. Could we create large data sets for important problems, be uniquely positioned to solve them, and have all top researchers in the world work with us, our data set? Other important areas are biotechnology and neuroscience, where we do have a fledgling industry and ecosystem.

Third, we should identify areas for specialization by examining those areas that are of our own national interest. Defense research comes first to mind, as manifest in nuclear, mechanical, robotics, material, cybersecurity, and also data science. Another national interest is manufacturing and manufacturing processes, including allied fields. If we wish to successfully convince the world to “Make in India,” we should pursue research in production and manufacturing processes. And most importantly, we need to consider public health and medicine, where India has a long way to go.

But who decides in which areas India should invest? The biggest mistake is to leave it to a single politician, bureaucrat, or even academician. What is hot and not in research changes rapidly. Research progress is nonlinear: suddenly a process, technique, or area previously of little importance sees a breakthrough and becomes an area of great attention. For example, the academic community had largely lost interest in neural networks about 20 years ago. Now they have come to dominate AI after Hinton’s deep learning work. It has suddenly become the largest focus of investment in the field.

No single person knows all our strengths: they are many and decentralized. The government rightly has a voice on what is of national importance. However, there needs to be other voices, and decisions on narrow areas of research need to happen through a decentralized process involving researchers. Grant-making agencies allocate funds in focus areas. Researchers on the other hand have discussions and alert the program managers to promising areas where they could create new programs. As an area of investment becomes successful, we need to accumulate investment and effort in it and grab a leadership position. Similarly, the heads of universities and funding agencies can meet periodically, to discuss priorities and align goals.

The institution’s specialties should also be determined through a deliberative process involving the department heads and high performing faculty. This is a bottom-up, top-down process to identify areas of strength and build capacity to take leadership in it.

## **Accumulate Effort**

To build leadership in an area, the most important requirement is a critical mass of researchers working collaboratively. When researchers combine forces, they make faster progress, can adapt to new methods, and can build on each other's successes. Successful and productive research communities guide the direction of research in the field. Impressed by their success, new talented researchers aspire to join them, they build their own forums such as conferences and workshops, and influence spreads to the industry. In this way, MIT, Harvard, and the United States in general have become doyens of new knowledge, amassing research success for a century or more.

One way to accumulate effort in identified areas is through mission-driven programs. Presently, DST runs about a dozen mission-driven programs including those in data science, clean energy, and supercomputing. Their nanotechnology program has been some-what successful in kick-starting quality research in this area. The number of programs is too small to be consequential. By contrast, DARPA has 100 program managers looking after 250 research programs. They govern the competitive bidding process to accumulate effort in their field. The United States dedicates considerable funding to all new promising fields, seeking to identify and extract their maximum potential. Some areas see success and draw more funding while others drop off to await some future breakthrough.

India could use more such mission-driven programs in narrower areas and problem statements, which could also be those of national interest. Worthwhile endeavors include cleaning the Ganga, decreasing pollution in cities, or effectively treating Indian strains of viruses. We can determine these areas of attention involving multiple area specialists and program managers, keeping them in steady rotation to ensure a steady stream of fresh ideas. The competitive grant process raises the bar, motivating people to do their best in writing a winning proposal. Such a process helps to accumulate efforts in areas of national interest and also attracts new talent. The further accumulation of funds, resources, and talent will be in the winning areas.

Currently, our defense and space organizations, DRDO and ISRO, respectively, have minimal interaction with universities. They should invite university researchers to help solve their research problems through call for proposals. This can help accelerate university research through supply of research questions, funding, and solution deployment opportunities. On the other hand, it will create local capabilities in the research areas relevant to them. We must note that defense-oriented research has led to some of history's greatest scientific successes, including innovations in air travel and the Internet.

Like nations, institutions also specialize and accumulate effort in those areas. No single institution can be good at everything. Within the fields of electrical engineering and computer science, the Princeton University is great at theory while CMU does very well in robotics, UIUC in building systems, and Berkeley in circuit theory. Our Indian institutions should also seek to determine their natural area of leadership through a collaborative process. Their specialty could be a function of their local strength, such as areas in which they have great researchers/funding already, proximity to certain industry, or problem space. They should accumulate faculty and resources in these areas. Institution leaders should utilize their wide networks to find champions in those fields outside the university and bring those people in.

A great way to accumulate talent and effort in new areas is to create new institutions that focus exclusively in the target field. These could be specialized institutions dedicated to neuroscience, biotechnology, and materials, among others. Google recently established a Google Brain Project, accumulating multiple star researchers in the field of machine learning to lead the effort. Allen Institute for Artificial Intelligence funded by Microsoft cofounder, Paul Allen, is another example. Such dedicated institutions have the potential to provide leadership in the entire field.

We must acknowledge a contradiction in the notion of accumulating effort in a particular area or creating specialized institutions: today, more and more research is multidisciplinary. In practical terms, this means that we need to build mechanisms for specialized institutions to work collaboratively on problems. There are many options to achieve this. For example, most important is that related institutions working in related fields should be situated in geographic proximity. In Delhi, we find IIT, AIIMS, and Delhi University institutions all in a similar locale. In planning new institutions, we need to consider geographic proximity.

Also, calls for proposals for interdisciplinary research will naturally incentivize people to work together. We should have interdisciplinary centers in the vicinity of institutions. They could house seed funding for interdisciplinary projects, equipment, support staff, and host talks and discussions. Champions recruited through a competitive process should run them.

## **Make Public Science Aware**

Much of our efforts to achieve research eminence will depend on public awareness and support. Multiple stakeholders must coordinate to create greater public awareness about science and research.

For starters, the government should raise the profile of scientific research by including it in its strategic priorities and giving it a place in the national discourse. India's scientific achievements should warrant the same attention as our economic growth numbers, IT power, and start-up culture. Attention should not be limited to ISRO, as it is today. A few words from the prime minister each year could inspire many young people to pursue a scientific career. As the government talks about pollution, constructing toilets, and saving electricity, they should also talk about promoting scientific thinking. How they could attach the abstract idea of scientific thinking to tangibles—like Gandhi's charka—is something I will let them innovate upon!

We can also create awareness through our current educational institutions. Our school curriculum and books should properly cover India's historic contribution to science: objectively, not with jingo-ism. We must go beyond Arabic numerals and Pythagorean theorems to discuss the contributions of our civilization to science. A focus on our heroes and national pride goes a long way in creating role models and instilling the "can do" attitude in youngsters. Such an approach will have the added benefit of spawning new research into the subject, which the government can sponsor through targeted and competitive grants.

Our top institutions should undertake greater outreach efforts to advertise research achievement. They should establish an outreach office staffed by professionals to periodically arrange public talks, campus visits by school students, and even summer camps. Going beyond, they should establish permanent science-related attractions on their campus. For example, MIT has the MIT Museum which chronicles the scientific achievements of MIT affiliates. Why not establish museums at IITs or IISc? Why not go beyond merely copying MIT's ideas and think how an innovative twenty-first century museum can be that would capture the public's attention and bring them to campus? If Akshardham Temple and Kingdom of Dreams can be on the Delhi tourist map for religion and entertainment, can we not think of anything as engaging for our science legacy?

Here is also an opportunity for news and entertainment media. India's English dailies have sections for business, entertainment, and sometimes spirituality, but not for science. Mainstream TV has little any science-related shows—we can only reminisce about the Turning Point from 1991, with the charismatic Professor Yash Pal. We do have Discovery and the National Geographic channel, but these feature little Indi-led content.

In a free market, business must run by demand. However, the airwaves are a public good, and I would argue that the media has responsibility for promoting scientific education and research advancement. I would go further and argue that there exists a latent demand among the public for science programming. We need a champion within these media enterprises, an entrepreneur within, to take a risk and highlight it. The government could help here by sponsoring shows or providing subsidies or tax breaks to media businesses that devote a percentage of their programming to science themes. The government needs to play a key role to seed and build a market.

### **Make Our Institutions Attractive to Researchers**

Above all, we must remember that research is only as good as the researcher. Just as a sports victory depends on the sportsman, research productivity and scientific advancement depend on the researcher. We must attract the best, highest achieving individuals to research careers. Presently we lose them either to careers in industry or to research careers abroad. Indian research careers are not attractive to our best students, who are much better rewarded financially by becoming a software engineer in an MNC, IAS officer, or a doctor.

We should wish that India becomes an ideal research destination not only for our own citizens but for the best researchers from around the world. The top institutions in the United States and Europe are home to a diverse array of talented individuals.

Immediately, we must concentrate on engaging our own best students in research. We are blessed with a critical mass of talented individuals who, when properly motivated, could drive the country's research agenda. Following this, we can market ourselves as a viable research destination to the best from the developing world and countries in geographical proximity. Countries in the Indian subcontinent, Southeast Asia, and Africa are natural choices. Not only would such individuals enhance the quality of our existing PhD cohorts, they would act as bridges to business and education opportunities in their home countries, breathing new life into our research ecosystem. Eventually we can expect to see researchers from the United States and Europe traveling here to work in areas where we have developed a strategic advantage and have accumulated success. Everything is possible, so long as we have both the intention and a defined policy to make it happen.

### **Awareness**

We need to package and sell the research career in India. We can spark general interest by disseminating the research achievements of our top institutions through Indian and global media. Then we need to shine a spotlight on the researchers themselves. Our best researchers should be well-known national celebrities just like our star entrepreneurs, CEOs,



sportsmen, and actors. Institutions should connect their research authorities to media outlets who are searching for answers to topical issues of today. These will serve as role models and inspire our youngsters to build research careers in India.

They have an additional task in becoming good aggressive door-to-door salespeople. Our top institutions must cease their passive ways, waiting for candidates to apply. They need to visit and sell the position of research faculty to PhD students at the top institutions in the world. They need to highlight their strengths by making presentations, meeting individual PhD students, and convincing them to join us by making them feel “wanted.” Similarly, they need to aggressively reach out to the top undergraduate institutions pitching their PhD programs, and also engaging them through talks. One should also consider a larger marketing campaign, like the Indian armed forces do today with a dedicated website, TV advertisements, and YouTube videos.

A large-scale structured internship program could help greatly. Our top institutions could recruit bright undergraduates to participate in research projects, working side-by-side with faculty and PhD students. All top universities run undergraduate research program for their students—MIT runs Undergraduate Research Opportunities Program (UROP),<sup>8</sup> UCB has Undergraduate Research Apprentice Program (URAP), and UIUC has Illinois Scholars Undergraduate Research (ISUR) among others. Our institutions should aim to recruit hundreds of interns both from the institution and outside, at least at the rate of 1.5–2 per research faculty. The mechanism to allocate these interns should consider the will of faculty (autonomy), merit, and availability of funds. These interns will be our most likely future PhD students.

Such outreach programs would be mammoth in size. They require a dedicated office with professional staff serving equal duty to convince and cajole faculty to participate and also to reach out to external institutions for recruitment. Faculty needs to be sensitized on the importance of their participation in such programs, to build excellence in the institution. Any right-minded faculty would understand the importance of recruitment to multiply the success of their work. The institution should put in the right incentive structure to encourage faculty to actively participate.

### Personal Benefits

Good advertising can only sell a good product. As we have seen, salaries for research faculty are lower than salaries offered by Google for a fresher software engineer. PhD student stipends are equivalent to IT service company salaries for jobs that require comparatively few technical skills. We need to more than double the PhD stipend and increase faculty salaries by 50–100 percent.

The long-term solution is through institutional autonomy and accountability. University leadership should have freedom to determine salaries. If they do not provide what is needed to attract the best, they will be left behind and lose on reputation and funding. In the short term, our institutions need to find nongovernmental sources of funding to supplement faculty salaries. To recruit top candidates, institutions must offer attractive salary at the time of hiring. Supplemental funding could come from industry, alumni, and foundations in the form of endowed faculty chair positions.<sup>9</sup> Our institutions should strive to add 100–200 chair positions over the next five years. These chairs could be awarded to currently high-performing faculty members and also as a lure to attract promising new talent.<sup>10</sup> Similarly, institutions must raise money to double the PhD stipend for the top 25–50 percent of students.

Finding ways to augment salaries and stipends will not be easy. Salary supplements can be viewed with distrust by the government. The government tries to maintain a fine balance of salaries among various public officials. They see any attempt to get add-ons as a way to go around their regulations. Donors on the other hand are happy to invest in buildings, equipment, travel, and even salary for additional faculty and students. But they see the augmentation of salaries for faculty as a “waste.”

This way of thinking needs to change. The government should see itself as subsidizing the faculty salary and being one of several donors toward it. In fact, they should encourage private fund-raising and then match over and above what the institute can raise from nongovernmental donors. Similarly, the private donors should consider that the government contribution toward salary is a subsidy— not necessarily the entire deserved amount. The fund-raising office of the institute should take it upon themselves to justify to donors why the salary of a chair professor should match global standards (in consideration of parity). They need to explain that in sponsoring a faculty chair position at MIT or Harvard, they would have spent a sum of 2 million dollars in the 1990s. A large portion would go toward salary with no government subsidy! On the question of supplemental salaries to sitting faculty, the office must clarify that they are funding a position, not a person: by virtue of their gifts, better and better candidates will fill the position in the future.

Salary augmentation may be the most formidable task for institutions. In the short term, however, there are many other things institutions can do to make themselves more attractive. These include well-maintained housing systems, medical facilities, child day care, and recreational facilities such as gymnasiums. These typically exist already, but are often over capacity and not well run. Outsourcing such functions might improve their quality and efficiency. Universities could establish an HR division responsible for campus life satisfaction— listening to grievances and addressing problems. At the end of the day (literally), we want our faculty to feel needed, respected, and cared for.

## Environment

In addition to salary and lifestyle benefits, we cannot underestimate the importance of professional environment. Even by doubling faculty salary, we might not be able to lure a MIT or Stanford faculty here. Here, they would not have autonomy nor great students, great peers, a culture of high performance, or a helpful, nonintrusive bureaucracy. Poor salary and lack of personal amenities might be elimination criteria, but not necessarily a selection criterion.

The professional environment builds over time, by accumulation. It is a chicken-and-egg scenario: good faculty attract good students, good students attract good faculty, etc. Our institutions may not have this environment now, but they need to demonstrate that they are mindful of its importance and must demonstrate to potential hires that they have a vision of how to get there fast. If the university leadership shows commitment to this goal, and has a plan that lists definite steps and can show some progress, it might be enough to entice some risk-taking faculty to take a chance. Anyway, risk-taking researchers often produce the best success.

Another way to go about it might be to get at least a few distinguished faculty members to the institution by any means necessary: persuasion, pleading, enticing, or otherwise! These few are a magnet to their fans: young faculty members who are inspired by their work and who have a strong desire to work with them and learn from them. An MIT alumna at a private research lab in India told me that he chose to come back because his adviser had come back for family reasons. Several of the adviser's students followed. If we can convince such people to come here and spend some considerable time, then faculty and student recruitment will become much easier.

Finally, we should consider our policies on attracting nonnative Indians. We discussed in the beginning of the section that Asia and Africa can be a fertile ground for recruiting research talent. Unfortunately, most of our government institutions scarcely recruit or fund foreign nationals as PhD students or faculty!<sup>11</sup> One of the IIT directors told me that the minister says the Parliament will not allow public money to finance foreign nationals. We should learn from the United States here, the land of immigrants. Even in the current political atmosphere, the United States still actively entices the most meritorious to join their ranks. Investing in great researchers means investing in India's future. In terms of economic and social benefits, and the enhancement of the Indian ecosystem, the nationality of the researcher is of no consequence. Science is a great uniter and an even better equalizer.

### Connect and Spur Collaboration

Researchers are social people who thrive on interactions, relying on their peers and their world at large to discover what is new and worthy of pursuit. Researchers need to communicate face to face, often, for progress to happen. Tacit knowledge is essential to good research, and it can only be communicated and exchanged in spirited discussions and collaborative efforts in geographical proximity—not through tightly written technical papers or cursory e-mail briefs.

How can we facilitate these interactions? For one, researchers and their collaborators must have easier access to international travel. Lack of travel funding remains a top concern among faculty members and PhD students. Our researchers should be free to travel as much as their projects demand. The long-term solution for adequate travel funding is to allow faculty to secure the money through project grants from government agencies. In this way, travel money will correspond directly to the professor's ability to raise money for his or her project, which is also some indication of the worth of the project and therefore the value of the travel involved. Furthermore, the terms of the grant should not unduly restrict the use of the money for conference travel specifically, but also allow some flexibility for visiting and inviting collaborators and guest speakers.

How much money should the agency allow for a given project? The onus on justifying the travel required falls on the proposal writer. However, it must be considered without prejudices associated with foreign travel grants. Travel is necessary in the work life of a true researcher. By my back-of-envelope calculations, a high-performing researcher and his or her students require more than double the current level.

In addition to supplementing travel funds, we must also lower the bureaucratic regulations and processes surrounding disbursement.

The government and the institution often place additional checks and balance on disbursement, even after approving the travel money. For example, they might necessitate getting an approval from a committee or the institute director for each individual trip. Once the funds are allocated, it is counterproductive to put such additional checks on the process. Researchers should be able to access the money without extra interference. Similarly, restrictions on airlines (such as the directive to fly Air India) must be eliminated. The government should rather create incentives for flying Air India—perhaps in the form of bulk discounts—not mandate it. For visits of foreign researchers, we need to ease the process of getting a visa.

Establishing travel money as a component of project grants may take time. In the meantime, we can find some interim solutions. For example, currently our institutions allocate travel money to each faculty equally. Meritocracy is a better system for allocation, based on factors such as project money raised, number of active PhD students, peer-review ratings, and so on. High-performing researchers deserve a greater portion of available travel funding for the simple reason that they make more productive use of the funds. Similarly, PhD students should also be subject to the merit system. If a student travels one time to an international conference for a great paper, he or she should be assisted with more funding, not eliminated from consideration because he or she used up his or her single allotment.

Governmental and institutional funds need to be made available for inviting international collaborators and guest speakers, together with mechanisms to give it out meritocratically. More importantly, providing reasons why any star researcher would want to travel here is the tough part. What does our present research ecosystem offer to world-class researchers? One possible incentive is money. China and Singapore among others have delivered truckloads of money to institutions such as MIT (and the faculty) for their faculty to come and participate in various programs. I would say we should not buy the vanilla money option, rather combine it with innovative pro-grams. For instance, create a pot that researchers from India and abroad could access jointly for research purposes. The Indo-US Science and Technology Forum operates in this way.

World-class researchers will visit India of their own accord if they think that their investment in time will pay dividends in their research. They can come for our unique research work, problem areas, data sets, forums, and lower costs. A “me-too” approach will not get us far. Consider that the major conferences and workshops were conceived and took place outside India most of the times. Replicating conferences and workshops in similar areas is useless and will garner no interest. But are there gaps to fill? For example, discourse in the area of assessments (my own specialty) mostly takes place in the pages of journals. The field has hardly any conferences. This is an opportunity to take the lead by raising funds and setting up a global program committee to organize and run it. Another example is Learning@Scale conference launched in 2014 buoyed by new research questions and answers MOOCs, such as edX and Coursera, offered. We can find a new or underserved area as well. If we can create recognizable value in our work and forums, the global community will not require extra incentives to come visit us.

Geographically, we need to “look East” in our global collaboration strategy. China, Singapore, Hong Kong, and South Korea have some very highly regarded universities. These countries are in near geographic proximity and have lower cost structures than the European and American universities. They are also more hungry for growth than their Western counterparts are. Enacting programs that could spur people exchange, talks, visits, and collaborations would help us widen our scientific research ecosystem.

Of course, collaboration is not merely an international affair. We should seek to spur collaborations and connections among our own Indian researchers. Simple things as shared cafeterias, inter-departmental luncheons, and various types of social events at our institutions can go a long way. Furthermore, we should not underestimate the importance of informal interaction between faculty and PhD students. Encouraging informal interaction is important in that it encourages and leads to formal collaboration.

Interuniversity centers, conferences, workshops, and summer schools can help spur collaboration among institutions. One novel idea is the National Mathematics Initiative. Established by SERB and led by IISc, it seeks to spur interdisciplinary research through work-shops, summer schools, and compact courses. Indian and international researchers alike participate. It chooses a theme each year and then accumulates effort around it. If we can multiply such initiatives as this, under the direction of faculty directors who are enthusiastic, engaged, and well supported financially, then we will witness another positive step in the right direction.

### **Bring Speed and Efficiency**

Researchers work best when they can work with speed and efficiency. One major roadblock is the difficulty of procuring and accessing instruments and materials. Most often, the reason is the bureaucracy with their associated committees and tenders. It all needs to go!

Excess of regulation stifles performance. Researchers should be entrusted with the independence to spend their allotted equipment funds with speed as needs arise, with the understanding that their purchases are subject to audit. Institutions need to establish procurement and financial diligence team in place, such as exist in many global corporations. They should monitor any instances of faking purchases or doctoring receipts and take due action as required.

In the field of research, the wisdom of buying any particular instrument at a particular cost is a tricky arena. The question of value is highly ambiguous in the world of super-specialized instrumentation, given the subjectivity in instrument performance. Furthermore, remember that much research takes place through trial, error, and hacks in instrumentation. Identification of the most suited instrumentation must be left to the researcher himself or herself out of deference for the trust that has been placed in him or her by the grant-making body. Additionally, an institution could establish a peer-review system to determine what is within the norm and provide feedback to researchers.

Such a system with procurement and financial diligence team will work well. Oftentimes, the mere existence of such bodies serves as a sufficient deterrent to fraud. Besides, even absent such systems, the waste or misappropriation of funds will be reflected in the researcher's work, thereby jeopardizing future grant awards. And let us never forget that the most powerful deterrent of all is the loss of respect the researcher would suffer in the eyes of peers.

The system may still experience leakage. As people will never be perfect, we must accept a certain degree of fraud. If leakage remains around 5 percent, it is a small price for the benefit of the 95 percent who are pursuing their work conscientiously and creating value for the economy and society. Anyway, why should we assume the government oversight boards are not themselves fraught with corruption? Are we confident that the multiplicity of bureaucratic committees and overregulation has actually reduced waste, or even slowed it down?

Researchers have difficulty procuring instruments, but they also have difficulty in using the instruments that are already available. This is due to the lack of well-trained staff who operate and maintain the instruments. Well-paid and skilled technicians are indispensable for the efficient use of sophisticated instruments. Without such personnel, institutions cannot even realize the ROI on the purchase of the instrument. They ensure ease of access and ease of use to the entire university community. Without such personnel, use of instruments is often limited to one or two faculty with some pre-existing knowledge of the materials. Additionally, a trained staff prolongs the life of the instrument and learns the nuances of the instrument to use it more effectively and for various purposes. They free the researcher from having to divert his or her time away from his or her research in order to learn how to operate the machinery himself or herself.

Last but not the least, the access to instruments should be widely open. In fact, many university instruments sit idle or are used 10 percent of the time at most. The instrument should be made accessible to all faculty and students in the institution. They should be able to block times to use the instrument. It should be also opened for commercial usage and academics at other institutions at a price. In case of excess demand, any of the regular prioritization methods may be used which takes into account precedence, purpose, and volume. This constitutes a potential untapped revenue source.

### **Create Research-focused Universities and Leaders**

We need to create great research institutions. They must be laser focused on becoming research leaders, endowed with all the resources they need to execute efficiently. All the interventions discussed until now can only be implemented through such institutions. We can reinvigorate the institutions we have already and also build new ones. It is not merely wishful thinking: looking around we can see examples of both. In China, SJTU has existed since 1896. Then in 1998, the school underwent a transformation that now places it among the top 150 institutions in the world, with a ranking of 16 in engineering. HKUST was formally launched in 1991 and is today the 31st university in engineering. In science and social science, it ranks between 101 and 150.

If our institutions are to excel to world standards, they must be led by individuals whose key focus is to advance research. This goal should be their prime motivator. They should not be bogged down by day-to-day administration such as coordinating teaching, regulatory reporting, facilities management, and admissions. This is where a lot of time of our university leaders go today. A strong leader must delegate the administrative tasks required to maintain status quo while he or she devotes his or her time 24/7 to pondering and advancing the vision around great research. In business terms, the relationship between the leader and his or her sub-ordinates should be like that of the CEO and the COO. Building new research programs, recruiting top research faculty, building research centers, raising money for research, and institutional collaborations—these things exclusively should be his or her domain.

And he or she needs to “own” them by accepting both responsibility and accountability.

These leaders must be able to articulate clear goals of where they want the school to be in 5, 10, and 20 years. Such goals can be a mix of outcome and input metrics. Outcomes can be citations, disruptive research results, IP generation, industry collaborations, press coverage, awards, and recognitions. Input metrics can be the number of schools, departments, annual budgets, funding raised, profile of faculty, number of international students, number of international trips, international collaborations, and research facilities. Many of these things are subjective evaluations, and not easily quantified by numbers.<sup>13</sup>

The university requires periodic research evaluations and bench-marking to determine how well it is achieving its goals. Such evaluations can be done through a combination of self-evaluation and evaluation by the university management, as well as external reviews, both from academia and industry. Evaluations should follow global standards, though informed by our local needs and focus areas. Lately, India prefers to reject global standards, whenever our institutions rank very low according to them. Programme for International Student Assessment (PISA), a test of school student achievement worldwide, recently gave India a low score, as did an international measurement of world universities. India responded that the tests do not align with India's circumstances. I would agree that benchmarking methods must be constantly re-evaluated and adjusted, and must take into account local conditions. However, criticisms and adjustments must be undertaken

scientifically, not politically. I doubt India has such a scientific proposal. The global parameters are 80 percent good enough.

Evaluation and benchmarking should be the domain of an exclusive university office that reports directly to the university leader. The university board as well as other stakeholders should have ready access to these reports, so that they cannot be censured by the leadership. The importance of such an office cannot be overstated. By these measurements, we will hold the university leadership accountable for performance. We have a good example in SJTU. It established the Office of Strategic Planning (originally the Office of Policy Studies in 1999) to take on these responsibilities and support the university to become a world-class institution.

The final ingredient for spurring research progress in India is “research in research.” We should embark upon a continuous scientific movement to understand how to best align our institutions to achieve scientific advancements useful both to ourselves and the world. This book is one contribution to such a movement. We need to learn from the examples from all the world-class universities across the globe. Also, we need to take account of our own particular needs, challenges, and strengths—through continuous experimentation, pilots, and analysis of results, we will learn how to move forward with our scientific agenda.

Notable examples include Philip Altbach from Boston College who has done substantial work in international higher education, some concerning India. Jonathan Cole of Columbia University and Henry Rosovsky of Harvard University have written books on the new American University and how to run a university, respectively. The Graduate School of Education at SJTU did substantial work on Chinese science and technology policy in the early 2000s, including how to develop world-class universities. Their work led to the Shanghai World Class University Ranking System, which has become a global standard today. India requires a similar concentrated research effort in deciding our science and research policy. Funding agencies, university leadership, and faculty need to work together to make this happen.

And while we think about the big picture, we must begin putting the bricks in place. A successful, future-oriented university is a well-structured university, with professional offices for industrial outreach, marketing, fund-raising, and alumni affairs. These tasks are critical and cannot be the domain of a few professors or devoted alumni. They require dedicated offices staffed by professionals who are answerable to the university leadership for their results. At the top of these efforts sits the university leader. These engines of growth must be his or her charge.

### **Nongovernmental Action**

The Indian institutions that we have been discussing are public institutions. Harvard University, MIT, and Stanford University are all private. One professor remarked to me that if one private university in India could show the way, it would transform the Indian research ecosystem forever. I could not agree with him more.

There have been some serious efforts at private higher education in India recently. However, most have focused on teaching, while others seek to fill subject matter gaps such as in social science. None of them was designed for pioneering global research. An Indian private research university is an idea whose time has come. Three to four experiments must start, and then some of these will succeed. I feel confident that there is sufficient interest from wealthy private individuals within India as well as Indians abroad who would support such a school. We are merely waiting for such higher education entrepreneurs to emerge and take the reins. In this book, he or she will find the justification and the blueprint for making it happen.

Similarly, there is opportunity to create world-class private research laboratories. IBM Research Labs, Microsoft Research Labs, and the erstwhile Bell Labs, have produced great and impactful innovations. They run on huge budgets: Microsoft Research Labs is estimated at \$500 million each year and IBM Research Labs at a billion dollars. Some Indian companies have attempted to establish private labs, and some labs have attempted to extend their operations here from abroad, but these efforts have not seen enough success. These need to be reinvigorated to become world class. We need to learn from the recent nonuniversity private research efforts like SpaceX, which have succeeded in doing the impossible.

Further, private players have intervened and impacted in areas such as policing, food security, and primary education, which are traditionally in domain of the state. They are capable of similar impact in progressing research. They can help with evaluations particularly. They can be watchdogs and advocates. India could use an Annual Research Status Report similar to Pratham’s ASER and Aspiring Minds’ employability report. Such evaluations would have to be based on data, and fortunately, substantial relevant data is already available in the public domain. Based on its findings, the organization can exercise its advocacy role by exerting pressure on the state and institutions for reform. The organization can also act as a rating agency providing feedback to individual institutions, driving competition, and helping optimal allocation of resources by merit.

Private organizations can provide similar services in consulting for research benchmarking and policy interventions. Such services would be useful for government universities to continuously improve, and private universities that are unsure

about how to go about establishing research programs, even if they want to. When I was at Queensland University of Technology (QUT) in Australia, I viewed a presentation from an education-consulting firm that was engaged in this type of work. In fact, QUT had hired the organization to rate it on various indices of excellence in higher education.

The scope of potential activity for private players is limited only by the creativity of individuals. Here are some more examples. Private actors can help research philanthropy. They can help donors find the best programs for their money and interest. Many such organizations operate today in the CSR space, helping funding organizations find the right NGOs. Private actors could create dedicated media companies around Indian science, whether newspapers, magazines, apps, or websites. Other companies could help identify and place PhD students and faculty. The possibilities are endless.

Furthermore, philanthropists can do more than just provide research funding. They can help create incentives and shape the market. Although these functions are also considered the domain of the state, philanthropy can use the power of wealth to influence change. They could create awards and provide monetary incentives for great research. They could help create social respect for researchers by promoting star achievers and recipients of funding through public talks and interviews. They can enable the ecosystem. They can do so much more than just write checks.

### **Promote Science Entrepreneurship**

Indian companies should be second to none. We do not need to merely copy Western models. We can have original ideas that reach the global market. We can create innovative new companies based on true scientific and technological advancements. I urge my entrepreneurial brethren and entrepreneurs-to-be to take up science entrepreneurship. With sound business sense, they will discover a large market, greater value, greater global appeal, and higher returns, than if they continue to pursue the same old, same old.

We need to connect PhD students to entrepreneurship. Currently we steer primarily undergraduates to entrepreneurial careers. A better focus would be on those who actually do research. We could have business and entrepreneurship courses within the PhD curriculum. Departments could host talks with investors and entrepreneurs at which PhD students could showcase their work. We should also encourage PhD students to undertake internships as part of their PhD study.

These efforts will build a bottom-up supply of interested individuals. But the ecosystem needs to respond. This is by providing funding for science entrepreneurship by investors who value innovation, respect the research process, and are patient in undertaking long-term, risky propositions. High net worth individuals should establish funds, incubators, and accelerators for innovative companies. If we can achieve one great success story, it will inspire the market to follow. Unfortunately, today the world seems to believe that we do not create next-generation start-ups. If we have the courage to invest and try, we can change this perception.

Creating competitions and awards for innovative companies can help. India does have forums for “innovative,” but these mostly cater to innovation in the business sense. We need competitions that recognize scientific and technological innovation. Competitions excite people to tread unknown territory—and if the competition holds out awards of funding, there will be great response. They also bestow important social recognition and succor to entrepreneurs who are dedicated for the long haul.

Science start-ups are an essential part of the research ecosystem. They are integral to realize the economic and social benefit of research. They show the public and the government the value of research, which helps build the case for continued support.

### **Find New Creative Ways**

So far in our discussion of how to improve the research ecosystem, we have focused on proven measures of success for which there exists strong evidence. Other countries have faced problems similar to us and have overcome them to create great research programs. While all these solutions hold promise, we are not limited by them. Numerous other possibilities exist for innovation in the pursuit of strong research programs. We can give the world new ways of doing research more successfully and develop unique methods and strategic initiatives based on our unique strengths.

In this section, I will let my pen loose and toss off several such ideas and suggestions. Some of these ideas might sound half-baked, but they might just ignite a spark.

### **The New PhD**

In the last two decades, access and communication have become infinitely faster thanks to new communication technologies. We no longer have to wait weeks or months for the latest research literature, spend extensive time manually marking corrections in documents, or for correspondence from colleagues. Regardless, the duration of the PhD degree has not decreased, nor has the quality of the PhD thesis improved. In fact, in the field of computer science, I find that these

written in the 1980s are deeper than many of those written today. It seems we are set in a system that is resistant to change. For some reason, we begin with the assumption that the PhD will take 4–6 years, and then the system works to fill up the time.

But is it all necessary? More and more people think not. Can Indian institutions demonstrate that PhD can take less time—say three years—without compromising quality of work? If one institution were bold enough to take on this challenge, they might just prove it to the world. For ourselves, it will be greatly helpful since the long duration of the PhD degree is a top deterrent for Indian undergraduates. This experiment is an opportunity in waiting.

Here is another. Today, substantial research happens in industry. In my company, I employed at least two people whose research output and results would have earned them a PhD from a world-class institution if they had performed the work there rather than here. But of course, no university will award them academic credit for these efforts. They cannot do research and teach in a university without a PhD.

Why not have a “fast-track” PhD program for people who have performed substantial research—enough to fulfil the typical requirements—outside of the university environment? In a year or two, they could satisfy their coursework and write their thesis. It is a win-win. The individual can move ahead in his or her career, industry can attract smart researchers, and universities can get a stronger supply of PhD students. These are just two ideas to create a smarter and more outcome-oriented PhD program.

### [The New Citations](#)

We traditionally measure research impact by citations. However today citations come in many forms: dissemination aka Twitter, LinkedIn, one’s homepage, and networks specific to research such as ResearchGate. These have become favorites of industry. We can aspire to develop new ways of measuring impact that take into account number of tweets, number of downloads, number of likes, etc. This type of communication may have a large impact on people’s lives. Here is an opportunity to take lead in creating such impact and measuring it.

Let us also consider the research paper itself. Are there new kinds of papers, just as there are new forms of citations? Already we see how the presentation of content has changed in newspapers, TV, and radio. Should research papers change too? In academia, many conferences in data science and computational biology request data sets and algorithms for verification. A leading data science conference, KDD, requires a short video on paper. Authors compete based on the number of views on their video on YouTube. These are incremental steps but suggest that the time has come for a change. What other new ways can we come up with to present research results for better and wider consumption? Could we use ideas from design thinking?

### [Network of Private Research Colleges](#)

India has 3000+ private engineering colleges. Today, these focus primarily on teaching. Can they undertake research as well and become viable options for our high-quality PhDs, within their current budgets? They can if each chooses one research area in which to specialize and attracts 5–10 high-quality research faculty. They can choose their areas according to their strengths: geography, tradition, current faculty specialty, or connections to industry. This is a small measure easily achievable within their budgets (costing perhaps a couple of crores annually—roughly \$300,000) and could create real output by realizing a critical mass in a single field. Together, they could accommodate 30,000 PhDs in research. Such a program would have a positive effect on teaching quality and reputation, and would inspire more undergraduates to pursue PhD study. Furthermore, these colleges would comprise a network, collaborating with each other on multidisciplinary research. The many colleges I talk to are looking for new things to do. Some would embrace this idea enthusiastically. But they need competent guidance.

### [The New Research Places](#)

I have often wondered why we need large sprawling campuses to house our new research places. Private labs exist in compact buildings in industrial areas. MIT exists like a set of buildings within the city. PhD students are typically blind to the campus and only see the path from their dorm to their lab! We should consider housing new research institutions in more compact spaces, which offer both functionality and savings. This can help us scale fast and invest in only what we need to get the maximum bang for the buck. Can government change their regulations regarding the physical campus? Can we experiment with private setups that do not require government approval? We can more easily change government regulation if we can first offer an example of efficiency and success. And here is another thought: what is the structure of the new research place in our age of mobile communication and virtual reality? I suspect that the school of the future would be unrecognizable to us today.

## Crowdsourcing Innovation

We find it pays great dividends to ask the crowd—the people at large—how to solve a problem. People engaged in other fields can sometimes solve a problem that confounds practitioners in the particular domain. This should not be surprising, given that they bring a fresh perspective and experience from their own field to the problem. The wider community is great in generating different ideas and approaches to problems that the experts can then develop into full solutions. This is not the traditional way of doing things in the typical research institution. Instead, a single researcher along with his or her student thinks about a problem and attempts to solve it. They do not involve outsiders. At Aspiring Minds, we have begun involving the “crowd.” For every new problem we pick to solve, we do a hackathon/competition of kinds. Participants from multiple teams generate good ideas and then the research engineer involved takes one or more to fruition. Can our institutions find mechanisms to involve crowd intelligence in the work of our researchers, perhaps by providing digital platforms and services? Can they determine issues of attribution and IP in such cases? By reaching beyond traditional knowledge, we could probably do better and faster research, with more chances of breakthrough.

## Equipment Manufacturing and 3-D Printing

India has connected strengths and weaknesses. If we can learn to address our weaknesses by applying our strengths, we will find our-selves on a fortuitous path. For example, we can build things at low cost, but our researchers suffer from lack of components and materials. Today, 3-D printing is revolutionizing how we think about lab equipment. You no longer buy the equipment, you print it! Today, you can print car and airplane parts, surgical instruments, and organs! Can India take a strategic bet in 3-D printing technology? If successful, we could democratize equipment availability for the world. If we developed a core competency in this technology, we could help researchers everywhere. This could provide a great fillip to applied research by making availability of customized components fast and with quality.

I am confident that India can become a leader in science and technology. This is the most opportune time to reinvigorate our research agenda—it is now or never. We need to take ownership, set our goals, and intervene according to the stated design principles. This is our responsibility to India and to humanity.

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## Principles for Digital Development

The following nine “living” guidelines designed to help digital development practitioners integrate established best practices into technology-enabled programs.

1. **Design With the User:** User-centered design starts with getting to know the people you are designing for through conversation, observation and co-creation.
2. **Understand the Existing Ecosystem:** Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community.
3. **Design for Scale:** Achieving scale requires adoption beyond an initiatives pilot population and often necessitates securing funding or partners that take the initiative to new communities or regions.
4. **Build for Sustainability:** Building sustainable programs, platforms and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact.
5. **Be Data Driven:** When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action.
6. **Use Open Standards, Open Data, Open Source, and Open Innovation:** An open approach to digital development can help to increase collaboration in the digital development community and avoid duplicating work that has already been done.
7. **Reuse and Improve:** Reusing and improving is about taking the work of the global development community further than any organization or program can do alone.
8. **Address Privacy & Security:** Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared.
9. **Be Collaborative:** Being collaborative means sharing information, insights, strategies and resources across projects, organizations and sectors, leading to increased efficiency and impact.



## Announcements

### INDICON 2018: Theme “Harnessing Technology For Humanity” at Coimbatore during 16-18 Dec 2018

With the theme of “Harnessing Technology for Humanity”, the 15th IEEE India Council International Conference (INDICON 2018), being organized by the IEEE Madras Section during December 15-18, 2018, at Amrita Vishwa Vidyapeetham, Coimbatore, with technical support from the Indian Institute of Technology Madras, promises to be bigger and better than before. With plenary sessions, keynote addresses by reputed academicians, tutorials, workshops, Student Paper contests, industry exhibits and stalls and most importantly, high quality presentations from the best of the researchers in India, no effort is being spared to make INDICON 2018, the best so far.

For details visit the website at <http://indicon2018.in/>

### IEEE Society Memberships

IEEE Society members stay technically current, network with colleagues locally and abroad, and collaborate on research and projects with leading experts -- all while taking advantage of specialized opportunities. Discover which Society, or Societies, best match your technical interests by joining today to take advantage of membership benefits ranging from access to cutting-edge technical periodicals and conference discounts to educational resources and worldwide networking opportunities. In addition, IEEE members enjoy deep discounts on Society memberships. Please visit <https://www.ieee.org/communities/societies/index.html> for more details of individual societies. Specimen for IEEE Computer Society is given below:

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**Website:** <http://www.computer.org>

### Some useful IEEE web links

- Global Benefits Finder: [http://www.ieee.org/membership\\_services/membership/benefits/index.html](http://www.ieee.org/membership_services/membership/benefits/index.html)
- 2019 IEEE Membership and Society Membership Dues: [http://www.ieee.org/membership\\_services/membership/join/join\\_dues.html](http://www.ieee.org/membership_services/membership/join/join_dues.html)
- IEEE Society Memberships: [http://www.ieee.org/membership\\_services/membership/societies/index.html](http://www.ieee.org/membership_services/membership/societies/index.html)
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- IEEE Student Activities: [http://www.ieee.org/membership\\_services/membership/students/index.html](http://www.ieee.org/membership_services/membership/students/index.html)
- IEEE Xplore Digital Library: <http://ieeexplore.ieee.org/Xplore/home.jsp>
- IEEE Websites / Sitemap: <http://www.ieee.org/sitemap.html>

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## Guidelines for submitting reports and articles to get published in the IEEE INDIA INFO, the India Council Newsletter (ICNL)

- Please submit the event reports within TWO months of its happening. Older events reported may be ignored.
- The matter may be in doc / rtf / txt format. Please avoid other formats such as pdf, jpg as they will not be considered.
- Please use SINGLE column format (while the report is prepared).
- Please avoid embedding the photos in the document relating to event reports. However, images referred in articles alone may be embedded at appropriate places in the article document in addition to sending them separately.
- Please send the event photos (typically one/two best) separately (even in they are included in the report).
- Preferred format for photos is “jpg”. Please avoid sending the photos in “bmp”, “png” formats.
- Photographs in digital form should not to exceed 1024 pixels in width. You may use any photo editing software (MS Office Picture Manager is quite useful) to re-size the image. This will reduce the file size of the images considerably. Pl. avoid sending large size photos (Sometimes we get files even up to 6 MB size). We generally recommend file sizes less than 500K.
- Provide your name, full affiliation, membership no. and email id at the end of the document.
- Send the matter by email with the subject: From <Section / College Name in short form> -- Report on <Event Name (short name is OK) & Date> eg: “From Madras Section / SSNCE -- Report on Conf on Wireless Networking dt. 10-11, Feb 2017”
- Please send the matter by email to [ieee.icnl@gmail.com](mailto:ieee.icnl@gmail.com)
- Please note that the matter sent to other email ids may get ignored and may not be considered.
- Please submit the matter for publication latest by 8th of the publication month (currently Mar, Jun, Sep, Dec as ICNL is a quarterly) to facilitate inclusion in that quarter’s issue of IC Newsletter.
- Please note that while all efforts will be made for publishing, due to certain practical constraints, the actual publishing may be delayed.
- We will be constrained to ignore the submitted materials, if they do not follow the above guidelines.
- Please co-operate with us by adhering to the guidelines specified.

### IEEE India Council Website

The website of the IEEE India Council (IC) has been redesigned using the Wordpress content management system and is hosted on the IEEE webserver at <http://sites.ieee.org/indiacouncil/> with the efforts of the web master Dr. Suryanarayana Doolla of IIT Bombay. The readers may find the following links of the IC useful.

Home: <http://sites.ieee.org/indiacouncil/>

Executive Committee: <http://sites.ieee.org/indiacouncil/about-ieee/executive-committee/>

Sections: <http://sites.ieee.org/indiacouncil/about-ieee/sections/>

Chapters: <http://sites.ieee.org/indiacouncil/about-ieee/chapters/>

Announcements: <http://sites.ieee.org/indiacouncil/category/announcements/>

Events: <http://sites.ieee.org/indiacouncil/events/>

Newsletter Archives: <http://sites.ieee.org/indiacouncil/newsletter/newsletter-archives/>

Conference Norms: <http://sites.ieee.org/indiacouncil/conference-norms/>

INDICON: <http://sites.ieee.org/indiacouncil/indicon/>

Student Activities – Awards: <http://sites.ieee.org/indiacouncil/student-activities/awards/>

M V Chauhan Student Paper Contest: <http://sites.ieee.org/indiacouncil/student-activities/mvc/>

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