FACTS: 7th largest area, > 3000 km N-S or E-W, 36 states + UTs, 29 languages, 8 major religions, GDP-$2tn, but per capita ~ $100, BPL ~ 22%, Literacy=74%, GER=15%
If science is seeking the fundamental truth of “KNOW-WHY?”, engineering is all about learning the “KNOW-HOW?”

Thus engineering must be devoted to providing solutions to societal needs, challenges and aspirations

Out of 1.25 billion people (17.5% of the world), nearly two-third (~ 800 million) of its population is below 35 years of age

India is projected to be the nation with youngest population of the world by 2020 (average age = 29 years)

Despite having a GDP of > $ 2.0 trillion (ranking 10<sup>th</sup> or even 4<sup>th</sup> in PPP terms), India is confronted with certain stark realities like: poverty, hunger, health care concern, security threat, inadequacy of basic amenities (housing, water, employment) and lack of ‘appropriate’ education

Engineering community must provide solution to problems of energy, defense, sustainability, security and education
SET PATH TO PROSPERITY – NO ALTERNATIVE

SCIENCE
Know-why?
Unravel nature
Curiosity/need inspired act Discovery

ENGINEERING
Know-how?
Man made replica Invention

TECHNOLOGY
Know-what sells?
Multiple copies Innovation

SOCIETY

SET [Science-Engineering-Technology] PATH TO PROSPERITY:
(a) Knowledge (data to wisdom); (b) Opportunity (job and business)
'IMPacting Research, INnovation and Technology

IMPRINT INDIA

First MHRD Supported Pan-IIT + IISc Joint Initiative

IMPRINT... is an MHRD initiative to address the major engineering challenges that India must address and champion to enable, empower and embolden the nation for inclusive growth and self-reliance. This novel initiative with twofold mandate is aimed at: (a) developing new engineering education policy and (b) creating a roadmap to pursue engineering challenges.
Brain Storming Meeting in Goa in April 2014

Ten Important Technology Domains and Milestones

*** Opportunities for IITs to Lead and Deliver

Presented by: Indranil Manna, IIT Kanpur

At the Visitor’s Conference, Rashtrapati Bhavan, 22 August 2014
<table>
<thead>
<tr>
<th>Symposium:</th>
<th>INAE-NAE JOINT SYMPOSIUM ON ENGINEERING EDUCATION IN THE 21ST CENTURY – ISSUES RELATED TO GRAND CHALLENGES</th>
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<tbody>
<tr>
<td>Date:</td>
<td>December 18-19, 2014</td>
</tr>
<tr>
<td>Venue:</td>
<td>NAE Head Quarters, Washington DC, USA</td>
</tr>
<tr>
<td>Participants:</td>
<td>Indranil Manna (IIT Kanpur), Tarun Mohindra (Embassy of India, Washington DC), B. S. Murty (IIT Madras), Amlan Jyoti Pal (IACS Kolkata), Deepak B. Phatak and V. Ramagopal Rao (IIT Bombay), Rajeev Shorey (DIT, Gov), B Ganapathy (TCS, USA)</td>
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<tr>
<td>Outcome:</td>
<td>Discussion on GCSP, Sharing of ideas/thoughts/notes, Exchange projects/visits, Plan for follow up actions</td>
</tr>
<tr>
<td>Follow up:</td>
<td>2(^{nd}) INAE-NAE Symposium on October 16-17, 2015</td>
</tr>
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</table>

Connect INAE-NAE dialogue on GC to IMPRINT-India (MHRD)
Dear Prof. Name,

As you are aware that the Government of India is focussing on “Make in India” with a view to enhance competitive strength of Indian Industries through Research and innovation in key sectors of Indian Economy. A framework on Impacting Research, Innovation and Technology or IMPRINT India including Terms of Reference and Research Groups along with details is enclosed.
Mandate I (Education Policy): To develop a comprehensive perspective and policy on Engineering Education in India to address IMPRINT goalposts

Mandate II (Research Policy/Roadmap): To define the nation’s research & technology needs specially in terms of the TEN technology challenges and assess the readiness in terms of manpower, research infrastructure and resources.
14 Grand Challenges for Engineering in USA in 21st Century

Grand Challenges for Engineering (USA):
An initiative of National Academy of Engineering, USA to define the 21st century’s Grand Challenges covering sustainability, health, security and joy.

Chair: William Perry (50 subject experts from 40 different countries)
Ten Technology Domains/Themes of IMPROINT

- Healthcare
- Information and Communication Technology
- Energy
- Sustainable habitat
- Nano-Technology Hardware
- Water Resources and River Systems
- Advanced Materials
- Manufacturing
- Security and Defense
- Environment and Climate

- IMPROINT is the Indian blueprint of the GRAND CHALLENGES of USA
- IIT Kanpur is the NODAL Institute with all IITs and IISc as partners
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Engineering Domains</th>
<th>Nodal Institute and Coordinator(s)</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Health care</td>
<td>IIT Kharagpur (S Chakraborty, G Saha)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Information &amp; Communication Technology</td>
<td>IIT Kharagpur (A Basu, PK Biswas)</td>
<td>New Education Policy</td>
</tr>
<tr>
<td>3</td>
<td>Energy</td>
<td>IIT Bombay (R Banerjee, S Bhattacharya)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sustainable Habitat</td>
<td>IIT Roorkee (P Banerji, A Biswas)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Nano-tech Hardware</td>
<td>IIT Bombay (V Rammohan Rao)</td>
<td>Roadmap for research to solve major engineering &amp; technology challenges of the country</td>
</tr>
<tr>
<td>6</td>
<td>Water Resources and River Systems</td>
<td>IIT Kanpur and IISc Bangalore (V Tare, PP Majumdar)</td>
<td></td>
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<tr>
<td>7</td>
<td>Advanced Materials</td>
<td>IIT Kanpur (M Katiyar, AK Singh)</td>
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<tr>
<td>8</td>
<td>Manufacturing</td>
<td>IIT Madras (MS Shunmugam, NR Babu)</td>
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<tr>
<td>9</td>
<td>Security and Defense</td>
<td>IIT Madras, IIT Delhi (V Kamakoti, N Bhatnagar)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Environment and Climate</td>
<td>IISc Bangalore (G Bala, RS Nanjundaiah)</td>
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</tbody>
</table>
### Institute Representatives

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Institute</th>
<th>Institute Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IIT Kharagpur</td>
<td>Prof. Goutam Saha</td>
</tr>
<tr>
<td>2</td>
<td>IIT Roorkee</td>
<td>Prof. Pradipta Banerji</td>
</tr>
<tr>
<td>3</td>
<td>IIT Kanpur</td>
<td>Prof. A K Singh</td>
</tr>
<tr>
<td>4</td>
<td>IIT Delhi</td>
<td>Prof. Kushal Sen</td>
</tr>
<tr>
<td>5</td>
<td>IIT Madras</td>
<td>Prof. V Kamakoti</td>
</tr>
<tr>
<td>6</td>
<td>IIT Indore</td>
<td>Dr. Bhupesh K Lad</td>
</tr>
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<td>7</td>
<td>IIT Guwahati</td>
<td>Prof. SRM Prasanna</td>
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<tr>
<td>8</td>
<td>IIT Bhuvaneswar</td>
<td>Dr. R K Panda</td>
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<td>9</td>
<td>IIT Hyderabad</td>
<td>Dr. Zafar A Khan</td>
</tr>
<tr>
<td>10</td>
<td>IIT Gandhinagar</td>
<td>Dr. Vikrant Jain</td>
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<tr>
<td>11</td>
<td>IIT Mandi</td>
<td>Dr. Bharat Rajpurohit</td>
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<td>12</td>
<td>IIT Patna</td>
<td>Dr. Preetam Kumar, Dr. Arijit Mondal</td>
</tr>
<tr>
<td>13</td>
<td>IIT Ropar</td>
<td>Dr. Subhendu Sarkar</td>
</tr>
<tr>
<td>14</td>
<td>IIT Jodhpur</td>
<td>Dr. V. Narayanan</td>
</tr>
</tbody>
</table>
An initiative of MHRD to make an impact through research and innovation in engineering and technology

Policy Initiative

Not Technology Development

Technology & Innovation

Education Policy for Inculcating Scientific Temperament and Innovation Skills

Research Roadmap for Technology Readiness
IMPRINT – Part A

Education Policy for Inculcating Scientific Temperament and Innovation Skills

School (STEM)

Interest in S&T

University (UG/PG levels)

Engineering Branches

Research Univ + R&D Labs (PDF/PhD/Projects)

Interdisciplinary

Manpower + Knowledge

Solution to India’s own problems
IMPRINT – Part B

Research Roadmap for Technology Readiness

- Competence and Capability
- Infrastructure
  - Technology
    - Product
    - Process
  - Goalposts

10 Domains and Related Themes/Targets/Topics

Targets
PLAN Ahead:

a) Timeframe
b) Strategy
c) Milestones
d) Roadmap
e) Funding

- Define/Identify: Title, Aim/objective, Scope, Challenges, Topics, Deliverable
- Reorient, Realign, Revise teaching and research for Focus and Impact
- Declare, pursue, discuss, review, compile the policy
- Policy on (a) education and (b) research
Planning of Key Approach II

IMPRINT

Domains → Themes → Targets → Topics

Titles of Thesis/Projects/Assignments/Internships

UG → PG → PhD

- Focus
- Continuity
- Complementarity
- Sustained initiative

- Approach Solution
- Develop Technology
- Achieve Leadership
CAMPAIGN ON IMPRINT – Crowd Sourcing

ESSAY COMPETITION IS OPEN FROM
30 SEPTEMBER 2015 TO 15 OCTOBER 2015

Eligibility
- Open to 4-year UG and 2-year PG students (including 5-year integrated UG-PG students)

Guidelines
- Maximum 2000 words/2 pages: including title, author's name and affiliation. Entry may include up to 4 photographs/figures/pictures/tables

Submission procedure and deadline
- Submission of entry is through the website (http://www.iitm.ac.in/Imprint/imprint-essay-submission-form)
- Multiple entries are permitted from a team of one/two students
- Authors must declare the authenticity and originality of the entries

Prizes
- Winner: ₹12000, First Runner-up: ₹5000 and Second Runner-up: ₹3000 (up to 3 prizes per domain)
- A prize of ₹25000 will be awarded to the overall winner of the Essay Competition
- All the winners will be invited to the Rashtrapati Bhavan for the Inauguration of IMPRINT INDIA INITIATIVE on 5th day of November 2015

For further details visit our website: http://www.iitm.ac.in/imprint
For queries email us at: imprint@iitm.ac.in

LOGO COMPETITION
Logo competition is open from
05 October 2015 to 15 October 2015

Eligibility
- Open to all UG and PG students (including PhD scholars) of all engineering/science disciplines

Submission procedure and deadline
- Submission of entry is through the website (http://www.iitm.ac.in/Imprint/imprint-logo-submission-form)
- Multiple entries are permitted from a team of one/two students
- Authors must declare the authenticity and originality of the entries
- You can upload your logo on the website before 8 PM of 15th October 2015

Prizes
- The winner of this competition will be given a prize money of ₹10000 and will be invited to the Rashtrapati Bhavan for the Inauguration of IMPRINT INDIA INITIATIVE on 5th day of November 2015

For further details visit our website: http://www.iitm.ac.in/imprint
For queries email us at: imprint@iitm.ac.in

Government of India, through MHRD, has launched a major national initiative, called IMPRINT India (IMPacting Research, Innovation, Technology for India) and has identified ten important technology domains for the nation. The objective of this flagship initiative is to identify the needs of the country in terms of its research and technology requirements so as to enable proper planning for manpower, research infrastructure and resources in ten domains of national interest. The outcome of this exercise would be policy documents on education and research.

In order to ensure success of this grand national initiative through crowd sourcing, it is decided to hold an All-India Essay Competition among the engineering and science students studying in IITs, IISc, IIITs, IITM, IITR and any other Centrally funded institutions with the objectives and guidelines as enumerated below:
MHRD Order on IMPRINT dated 24 March 2015

1st Workshop at IIT Kanpur, 11 May 2015 (Technology Day)

2nd Workshop at IIT Delhi on August 16, 2015 (All IITs)

Video Conference Meetings on 15 Jul, 2 Aug, 1 Oct

Major Actions/Initiatives:
• Domain leaders identified
• Institute representatives identified
• Record of deliberations shared
• Team formation over (may expand)
• Website being created (to be launched on Nov 2)
• Information booklet being designed
• Essay contest launched
• Logo contest launched
• Several domain specific workshops held
I IMPRINT deliverables are Policy reports/documents
Teaching, Curriculum, Technology benchmark,
Infrastructure readiness, Education policy (Class 8-12,
College, University)

II IMPRINT report: Content
Define needs and goals, Current status, Identify important
domain/product/technologies, Present status to future goal
– Gap analysis, How to bridge the gap in research and
education policy

III IMPRINT Report: Approach
Meetings, Seminars, Questionnaire, Theme-based
Workshops, Video Conference/Skype meetings, Expert-
group Workshop (with national/international experts)

IV IMPRINT Report: Timelines
❖ Report I: Oct 2015 (short, 2-4 page per theme)
❖ Report II: Feb 2016 (~10 pages on each theme)
❖ Final Report: May 2016 (~20-25 pages per theme)
Academia creates/disseminates **KNOWLEDGE**

Society **CONSUMES** and **DEMANDS**

MODERN ECO-SYSTEM IN S E T

Industry produces/provides solutions as **VIABLE TECHNOLOGY**

Research organization pursues **INNOVATION** in S E T
Enabling Education in Engineering Domain

HUMANITIES & MANAGEMENT

EDUCATION IN ‘SET’
SCIENCE ENGINEERING TECHNOLOGY

INDUSTRY

SOCIOLOGY

RESEARCH
NEED TO INTEGRATE

- MHRD Flagship Projects
- SWYAM (MOOCS), PMMMTT, RAA
- YUKTI, SandHI, GIAN, Ishan Vikas
- Clean India, Digital India, Make in India
- CII, FICCI, ASSOCHAM, Industry
- Niti Ayog, Other Ministries, Funding bodies
- Strategic sectors in India (DAE, DOS, DORD)

MAJOR EVENT AHEAD

National Launch of IMPRINT on 5 Nov 2015 by the Honourable President and PM (in presence of HRM) at the Rashtrapati Bhavan
Concluding Remarks

- IMPRINT is not only for IITs/IISc; it is a national movement providing an opportunity for the higher echelon institutes in India to integrate with all grass root level institutes, industry and organizations, mutually complement and deliver what the country demands and aspires.

- Policy is our immediate mandate, technology (products and processes) is the next goal.

- Immediate output: problem definition with \[10 \text{ domains} \times 10 \text{ themes} \times 10 \text{ targets} \times 10 \text{ topics} \times 100 \text{ partners}\] = \(10^6\) projects/theses/intern/ideas.

- Aim: Million to billion by crowd sourcing.

Thank you, Namaskar and Jai Hind!