NITs as Drivers of Quality Higher Technical Education – The Way Forward

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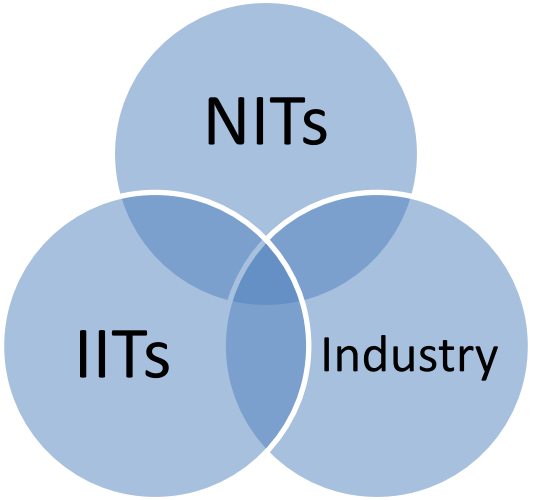
Schedule of Meetings

SN	Place	Date	Remark
1	IIT Mumbai	14th February 2012	Preliminary Meeting Terms & Conditions
2	IIT Delhi	21st March 2012	Meeting with Directors of NITS
3	MNIT Jaipur	13th April 2012	Visit to the NIT Jaipur
4	NIT Calicut	7th May 2012	Visit to the NIT Calicut
5	NIT Silchar	18th June 2012	Visit to the NIT Silchar
6	MHRD New Delhi	18th July 2012	Meeting with Industry representative
7	MHRD New Delhi	23rd August 2012	Meeting with Directors of NITS
8	IIT Mumbai	8th October 2012	Early PhD induction, Industry Institute Interface
9	IIT Mumbai	8th November 2012	Funding pattern, Trainee Teacher
10	IIT Guwahati	4th January 2013	Meeting with Directors from N-E & State Officials
11	IIT Mumbai	28th February 2013	Apex Selection Process, Review mechanisms, Fee
12	MHRD New Delhi	26th March 2013	Grouping of NITs, IIT-NIT Pairing
13	IIC New Delhi	20th June 2013	Towards excellence in UG Education
14	IIT New Delhi	20th July 2013	Discussion on final report preparation
15	IIT New Delhi	23rd August 2013	PPT Presentation for NIT Directors
16	IIT Bombay	10th September 2013	Meeting with Directors of NITS
17	MHRD New Delhi	5th November 2013	Discussion on feedback from NIT Council Meeting, 4 more
18	MHRD New Delhi	16th December 2013	Report finalization
19	IIT New Delhi	15th January 2014	Report finalization
20	IIT New Delhi	29th March 2014	Report finalization
21	IIT New Delhi	7th April 2014	Report finalization

Interacted with Directors, Faculty, Non-teaching staff, students, representatives from Industry etc.

Report Focus



Challenge I – Higher technological competence on a scale commensurate with the size of the country

Challenge II- Large scale research driven innovation echo system

- Towards excellence in UG education
- Towards excellence in R&D
- Towards excellence in Product Development and Industrial Interface
- Towards excellence in Leadership
- Governance

ICT enabled Direct-to-Students high quality teaching/learning

- Fiber Connectivity to each NIT on NKN
- Live delivery of High Quality Teaching in classrooms using video on DTH and high-speed internet
    - Placing the Best teachers in front of students
    - Controlled interactivity between students and Teacher
    - Part of main curriculum in selected colleges
        - about fifteen classes where rest of course/ tutorials/ Interactions handled by local faculty
        - Local faculty to be present during live-classes for interactions
- Interactive e-Content
    - Tutorials and Group Discussions
    - Courses on Web: MOOC
    - Practice and Lab experiments
    - Vocational Augmentation Courses

Getting industry person to start offering 25% of each course via video

- **Industry-personnel to use video to teach remote classes at NITs**
  - Course-faculty to be present in class and participate in discussions
    - Industry-oriented / practical quality teaching
    - Faculty will build relationship with a few industry personnel
    - Students build some contacts / relationship with industry personnel
    - Industry-personnel builds relationship with institute

Group-evaluation to encourage students to perform in groups

- Educational Evaluation today is largely individual based
  - At work place engineers have to perform as a group
- Ability to perform in a group matters
  - Education should inculcate this attribute and also evaluate it.
- Known that students learn best in a group
  - Higher-performers attempt to pull up weaker students
- NITs to take a revolutionary step of promoting and evaluating group performance and add it to individual's score
- Special emphasis on "Design"

Motivating Best UG students to become teachers

- Encourage top 15% of UG students to join as "Trainee-Teachers" at NITs
  - Need to qualify and simultaneously enrol for PhD at one of IITs
  - Would be at NIT as "Trainee Teacher"
    - Could teach part of the course after a few years
  - Attractive salary
- Carry out PhD courses using remote video
  - -- Teaching Pedagogy a part of course work
  - Carry out Research at NIT with continuous video-interaction with guide and frequent visits to IIT
  - one to two semester at IIT
  - Should complete PhD in about 5 years (maximum 8 years)
- On competition of course, become Assistant Professor

Training for existing young faculty

- Train existing teachers through online means
  - Short-bursts of in-person training periodically
- Training in pedagogy, subject matter and R&D
  - a five-level certification course towards improving quality
    - each level of certification has incentives
- NIT - Tier evaluation to use
  - Number of faculty through quality certifications
  - Number of new faculty through teacher-trainee program

Motivating UG students towards Research

- Enabling Best NIT students to go for direct PhD at IITs at the end of third year
  - CFTI students in top 15% of class at the end year three without GATE for direct PhD program
    - 4th year program at IITs – credit transfer to NIT towards BTech
    - Comprehensive in middle of 5th year
    - Students need to give GATE examination in their third year
- Common guidelines for all NITs
  - Credits for 10 theory courses at IIT to be equivalent to final year credit requirement at NITs including project

NIT Faculty Appraisal

- Each year, all faculty expected to fill-in a self-appraisal
  - Detailed coming year Goals (including time planned for each activity)
    - Teaching including BTech / MTech Projects) : say 35-40%
    - Academic Research including Research Guidance): say 15-30%
    - Industrial Consultancy and Tech Development: say 10-35%
    - Administration and Outreach: say 15-20%
  - Self-evaluation against Goals set previous year
- Evaluated by a departmental committee for young faculty
  - institute-level committee for senior faculty
- External peer-evaluation once in three years

External Performance reviews

- Departmental Visiting Committee - for comprehensive departmental audit
  - Peer Committee Visits towards enhancing academic and research programs in the department
    - Two industry and two academic people - Board to approve names
  - Periodicity: Yearly (minor), biennial (major)
  - Objective: to push Quality in teaching, R&D, industrial collaboration and leadership
- Institute level minor review once in three years and a major review once in six years. Review would also determine tiered rating of the Institute
- Third Party continuous Survey for students, faculty and stake holders

Strengthening and creation of infrastructural facilities

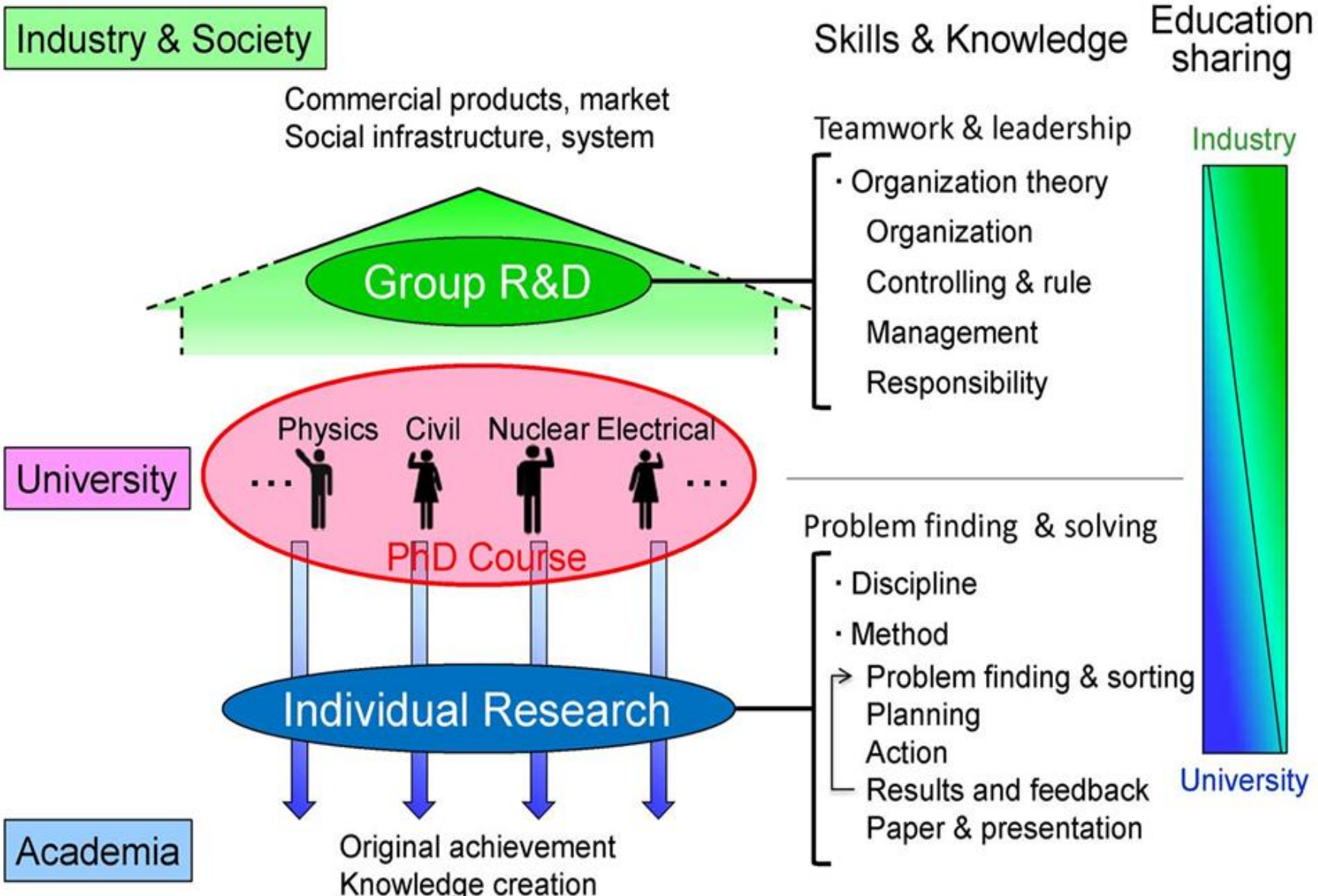
- Some of the facilities to be created in form of departments, centres etc
- Utilization of corpus fund to create infrastructure
- MoU with NITs / CFTIs for sharing of costly resources
- Optimum use of space / infrastructural resources
- Help from Alumni / Industry for creation of infrastructural facilities
- Creation / maintenance of infrastructure shall be outsourced
- Work proactively for creation of electronic / smart campuses

Definition of three tiers for NITs

- Definition:
  - Tier AA – Excellence in Teaching + Research + industry interaction
  - Tier AB – Excellence in Teaching + Excellence in either Research or in industry interaction
  - Tier AC – Excellence in Teaching and developing in Research and industry interaction
- The tiers could be awarded based on
  - NIT reviews done once in three years
  - Departmental Visiting Committee Report
  - Surveys Carried out by an external agency amongst students
  - Number of teachers hired through teacher-trainee scheme,
  - Number of teachers who have participated in trainings at different level of certification, R&D projects, Patents, awards
  - Interaction with industry, Projects from Industry, Consultancy

Grouping to determine level of financial support from MHRD

Concept of PhD Education in UT-Engineering Sector



Towards Product Development and industry-academia interaction

- Technology Development Institute with Strong Industry Interface
  - Teaching by Industry (enriching the courses)
  - Industry cell at NITs
  - Sabbatical for faculty at industry
  - Industry personnel as adjunct faculty
  - Innovation eco-system, Entrepreneurship and incubation and Research Park
  - Involving industry persons at board level, evaluation and ranking

Industry cell at NITs

- CII or FICCI or ASSOCHAM create an industry-connect cum technology development / transfer cell at each NIT
  - NIT to provide infrastructure
  - funding a third each by MHRD, State government and Industry-bodies.
  - managed by a industry-appointed person
  - Board: 1/3 members each from industry-organisation, state government, secretaries, appointed by institute board / NIT council
- Objective
  - to work towards increasing industry linkages in the institute
    - Industry-Institute Research Collaboration, Patents generation and exploitations
    - also help in Entrepreneurship Development through incubation and training
    - Strive for Development and deployment of scientific/ technological solutions to solve challenges states are confronting in the areas of water, energy, waste management, food and healthcare.

Sabbatical for faculty at industry

- desirable for NIT faculty to spend some time at industry
  - Contributes to NITs grading

Industry personnel as adjunct faculty

- need not necessarily have Masters or PhD degrees
- But par-excellence experience and achievements in industrial R&D sector
- Could participate in teaching, project guidance, research guidance and technology development

Innovation eco-system, Entrepreneurship and incubation and Research Park

- Conducive innovation ecosystem leads to development of novel technologies
- Ambiance of innovation and entrepreneurship impacts teaching
  - faculty gets first-hand knowledge of what is useful and used in industry.
  - introducing real-world examples and insights not in textbooks is exciting and motivates students
- Innovation thrives in an in interactive ecosystem consisting of
    - faculty member with breadth of knowledge
    - Experienced industry R&D person to convert a lab prototype into a commercial product
    - a bright youngster/student is that s/he does not know that "it cannot be done" and is therefore ready to plunge in
  - IITMRP used this and also evolved a credit system to measure the involvement of the industry with IITM
    - NITs need to learn from this experience and innovate on the model for its purpose.
      - Research park flourishes only when institute already has experience in working with industry
    - NITs could begin with by creating small space on campus itself and get some industry to temporarily house its R&D there
    - get state government to carve out significant land around campus and bring industry

Innovation & Entrepreneurship

- Significant changes in promotion policies, academic structures, curricula and mind-set of the faculty, students and administration required
  - Needs to be pursued for 10-20 years to achieve success
    - many failures, learning from the failures and occasionally succeeding
  - Requires a good commercial understanding
    - Leadership of these cells should be with faculty who understands it
    - Most faculty in IITs or NITs do not have this understanding -- need to learn
  - Innovation is inherently inter-disciplinary in nature while silo mindset will hurt
    - Need to have inter-disciplinary Masters / PHD programs and recruit Inter-disciplinary faculty
    - Need to allow courses across departments
    - take off for a semester and try participating in a start-up and come back
    - take up some project work instead of a course

Involving Industry personnel towards Governance

- Involving talented industry personnel in all aspects of governance
- Young industry persons (40 years) in departmental Visiting Committee and as members of Board of Governors
  - Identify energetic persons willing to spend at least 15 days in a year in the institute
- NIT Council should involve industry personnel in evaluation and ranking of NITs

Creating the right culture

- Seeking feedback from industry
- Set up an industry advisory group
- Board to define targets for getting R&D projects
- NITs as high quality research institutions
- Joint research projects between NITs and IITs by formation of groups
- Linking NITs in North East and J&K to regional development
- SPV

Grouping NITs and IITs

- Groups
  - One Established and one new IIT + four NITs (two established and two new)
  - IIT-Roorkee + IIT Hyderabad + three NITs (at least one new)
  - IIT BHU + IIT GN + three NITs (at least one new)

- For each group
  - three faculty members from each IITs belonging to different disciplines as members of each NIT senate
  - two faculty members from each of the NITs could be brought in each of IIT senate
  - one faculty from each IIT in Governing Council of each NITs

Joint Research between IITs and NITs

- NITs to stop in-house faculty PhD program
  - faculty should register with IITs / other CFTIs / other institutions of repute in India and abroad
- IIT + NIT faculty Joint Projects
  - work at both places + frequent visits and exchanges (faculty + project staff + student);
  - MHRD budget ₹25 Crores per year
  - no one project should exceed ₹100 lakhs
  - Industry involvement in such projects could be a bonus
- Some MHRD centers in frontier areas of technology
  - joint-centers involving at least one IIT and one NIT
  - At least a third of the total funding should go to NITs
  - NIT UG students to be involved and encouraged to go for early PhD induction program

IITs - NITs Interaction

- High-performing young NIT faculty sabbatical to IITs for a year / semester
  - Incentive + salary + campus accommodation at IITs
- High-performing IIT faculty should spend a semester at NITs
  - Special pay + salary + campus accommodation at IITs
- Encourage natural formation of India-level academic group consisting of faculty-researchers from IITs and NITs in different area
  - On maturity some funding from MHRD towards travel and meeting expenses
  - national level discipline academic conference at IITs / NITs
- most faculty + research scholar participate (NCC is an example)
- Change in policies to encourage mobility of researchers between institutions (IITs and NITs) and across domains

Towards Leadership

- Superior capabilities that earn respect from colleagues
  - Right vision for NITs and ability to create a shared vision
- Clarity about the roadmap for transformation
  - Courage to transform through creation of buy-in by colleagues
- Team building and lead by self example
- Collective decision making and ownership
- Confidence in fair play on part of leaders
- Ability to ensure right signaling at different levels
- Nurture different stakeholder linkages

Leadership at all levels

- Nurturing future potential directors for NITs
- Setting up culture at each NIT for participatory decision making -- accountability
- Strengthening Governing Boards
- Training Administrative machinery (Registrar / deputy registrar / finance officer)
  - Contract employment and outsourcing
- Financial structuring
- Create faculty awards at NIT council level

Director

- most important position and determines the present and future of the institution
- An individual in the field respected by all for his/her capabilities and track record
  - also must be an inspiring leader, capable manager and a passionate team person
- Search and selection of the Director should enable identification of such a person with high degree of success
  - Once selected, should have a free hand in taking institute forward within the framework of NIT Act and Statutes
- duly guided by the Board of Governors
  - Main role includes strategic planning, academic and administrative reform, Industry linkage, Capacity building, research and technology innovation, fiscal budget and resource mobilization, contribution to social welfare and national growth.

Deputy Director

- Main role to take care of routine functioning of the institute
- Deputy Director shall lead the institute in absence of Director
- Deputy Director will be appointed by Director with the approval of BoG
- Avoid co-terminus of Director and Deputy Director

Having evolved from different backgrounds NITs have a higher transformational challenge

- IITs have evolved following more or less a common framework over years
  - could be a good model to emulate
- Promotion of horizontal interactions at multiple decision making and performance layers would have positive catalytic influence
- Rapid filling of large backlog in faculty vacancies by young energetic high quality academics
  - A systematic approach to their development duly influenced by external best practices (as in IIT for example)
  - This could become an effective driver of positive change

Learning from each other

- 30 NITs are a large enough system to sustain a leadership development program at various levels
  - Exposure to best practices in different functions in NIT + training in leadership development
  - Sharing of management systems and SOPs among NITs
  - Greater exchange of infrastructural resources
  - Transformation to new system consistent with NIT A&S
  - Inter-institute faculty exchange programme

- Fair and transparent performance appraisal system and a system of awards for high performers

Administration and Finance Leadership

- Must ensure a facilitating administration and finance system
  - that leaves academics to devote their entire time to academics and research in a hassle free manner
- Capable and efficient support system to facilitate activities of Institute, Departments Centers and individual academics
- Ability to translate needs of Academic Leadership envisioned Academic and Research programs to action
  - through an efficient and rule bound system that facilitates objective oriented implementation
- Vertically integrated Administrative and Finance framework
  - linked with different layers of the academic and research activities
- with the objective of playing a facilitating role at all layers.

Create awards at NIT council level

- To be chosen by Council-committee every year for
  - Best teacher
  - Best faculty in R&D
  - Best faculty in technology development and industrial interface
  - Best faculty in administrative role

Linking of NE and J&K NITs towards local development

- 8 NITs (2 old and 6 new) in north east and one in J&K.
  - 50% admissions reserved for in-state students
  - Presents an opportunity to involve these graduates towards regional development
- Recommends an empowered SPV to promote this
  - with Government (state and Central), Industry and Institutes as partners
  - Create a fund from NITs, State Government and donors
    - Promote Engineering and Consultancy work in the region
    - Promote entrepreneurship to set up enterprises in the region
    - Pilot business in the region for corporate houses
    - Support BPO operations in the region

Standard Operating Procedures (SOP)

- Addition / modification in ACT and STATUTES
- NITs must have organizational chart with duties and responsibilities
- Multi-layered structure for participative governance
- Standard procedures
  - Administrative manual
  - Academic manual
  - Updated MIS
  - Purchase procedures
  - Hostel manual
  - SOP for various other activities

Non-Teaching Staff

- Provide adequate opportunity for up-gradation
- Encourage Training need analysis (TNA)
- Should be encouraged to develop multi-tasking skills
- NITs should hire research staff on contractual basis
- Outsource work related to campus upkeep, maintenance of security, sanitation, mess, cafeteria etc.

Participation of Alumni

- Support for institutional social responsibility
  - Helping in community outreach programmes and extension activities
- Academic support
  - In form of guest lectures, research consultancy and support, industry collaboration, tie-ups etc.
- Administrative support
  - Strategic planning and goal-setting
- Financial support by the alumni
  - In form of donations, scholarship, endowment, fellowship etc.

Thanks