

The New Engineer

Building a more sustainable and equal society.



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IIT Bombay

Today's Agenda

- Development Outcomes
- The Diagnosis
- The New University
- The Case-Study Framework
- The UMA Framework

Today's Situation

Higher Education: The only systematic way for social change.

Today situation: A consequence of decisions made 10-20 years ago.

- **Booming IT** - but no manufacturing, poor state of agriculture
- **Central, Elite Institutions** - Loss of collective action, loss of language and culture, and scientific temper.
- **Any number of graduates** - but unemployable
- **Lots of “opportunities”** - devaluation of school education, migration to coaching classes

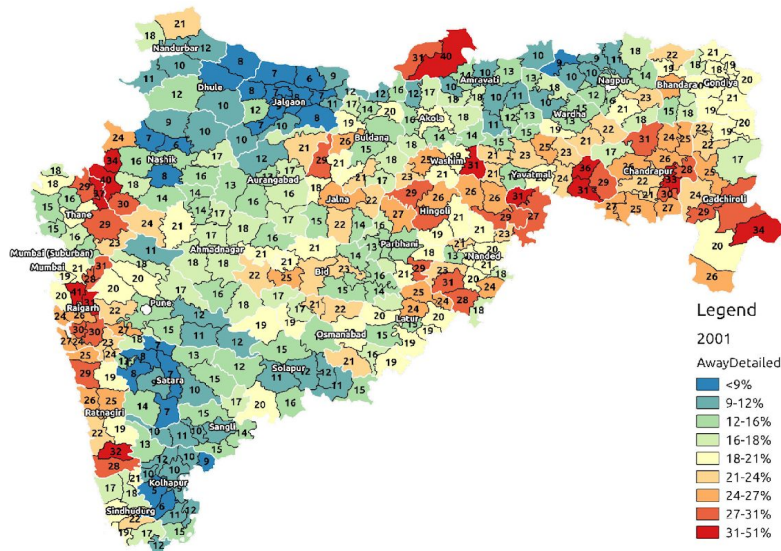
The Question

- How will basic development services improve?
- How will our small enterprises grow?
- Where will good jobs come from?

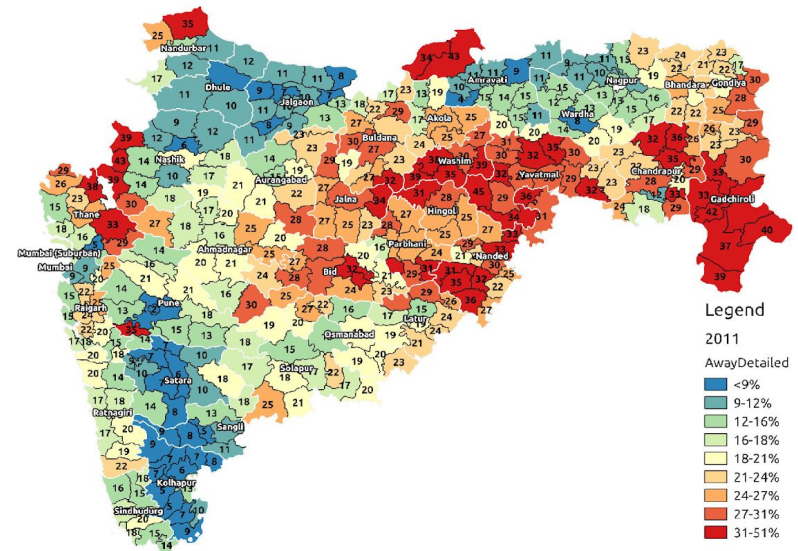


Development Deficit

Percentage of Rural Households with Primary Source more than 500m away (2001)



Percentage of Rural Households with Primary Source more than 500m away (2011)



Other Metrics as well

Year-round access to DW-**74%**.

Droughts, chulhas, public transport, small manufacturing etc.

Missing: institutions, community and private sector-
knowledge.

Economy: Sectors and Employment

- Sector Wise GDP (World Bank database)

India	Agriculture	Industry	Services	Per capita (in USD)
GDP (2012) (%)	17.4	25.8	56.9	4K
Employment (%)	51.1	22.4	26.6	-
GDP China	10	44	46	9K
GDP S. Korea	3	40	57	30K
GDP Germany	1	28	71	43K

- Top Formal Employers (Labour Bureau, Govt of India)

Industry	Food	Textiles	Metals	Apparel	Non-metals
Wages (Rs. lakhs)	0.70	0.80	1.35	0.67	0.69

Other Indices

- Steel Consumption (World Steel Association)– points to lack of virtuous cycle in railways, roads, infrastructure

India	57	China	477
Other Asia	69	Japan	506
Egypt	95	USA	306
UK	145	Netherlands	200

- Year Round Drinking Water Availability (NSSO, Census)

Year	Rural	Urban
2012 (69th NSSO), per 1000	858	896
Maharashtra	745	931
2008	862	911

Placements

Engineering Placements 2013 (IIT-Bombay)

Table : Numbers by sector and profile and average annual salary in Rs. Lakhs

Sector	Engg.	Finance	Consulting	IT
Super-GG	25 (27.7)	10 (35.0)	8 (49.6)	41 (52.1)
GG	116 (7.9)	82 (11.7)	110 (9.6)	102 (10.0)
IG	52 (6.5)	19 (7.2)	11 (5.8)	28 (7.2)
GI	24 (9.3)	10 (14.2)	10 (5.2)	5 (9.3)
II	64 (6.5)	13 (9.5)	8 (5.8)	22 (7.9)

So why are IIT graduates not doing engineering? What would be the situation for IIT Ropar graduates?

Research Areas

- Misallocation of effort and funds into research in areas which are not relevant

Table 4: Number of papers with phrase in the title, with at least one author from India (Scopus)

Topic (Phrase)	All years preceding 2003	2003-2009 (TEQIP I)	2010 onwards (TEQIP II)
<i>Water Supply</i>	84	74	87
<i>Sanitation</i>	30	51	63
<i>Groundwater Models</i>	11	29	70
<i>Public Transport</i>	5	15	25
<i>Power Grid</i>	12	56	288

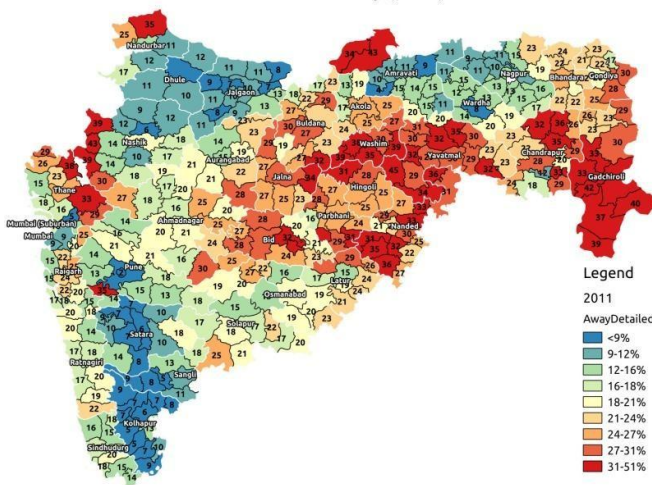
Table 3: Number of papers with phrase in the title, with at least one author from India (Scopus)

Topic (Phrase)	All years preceding 2003	2003-2009 (TEQIP I)	2010 onwards (TEQIP II)
Neural Network	692	1818	2467
Fuzzy Logic	110	327	759
Wavelets	96	905	1846
Genetic Algorithms	262	989	1373

Development Deficit, Employment and Training

Poor Development Outcomes

Percentage of Rural Households with Primary Source more than 500m away (2011)



Development needs formalization and professionalization.

Must create academic and research frameworks and correct incentives.

Great Demand for basic amenities

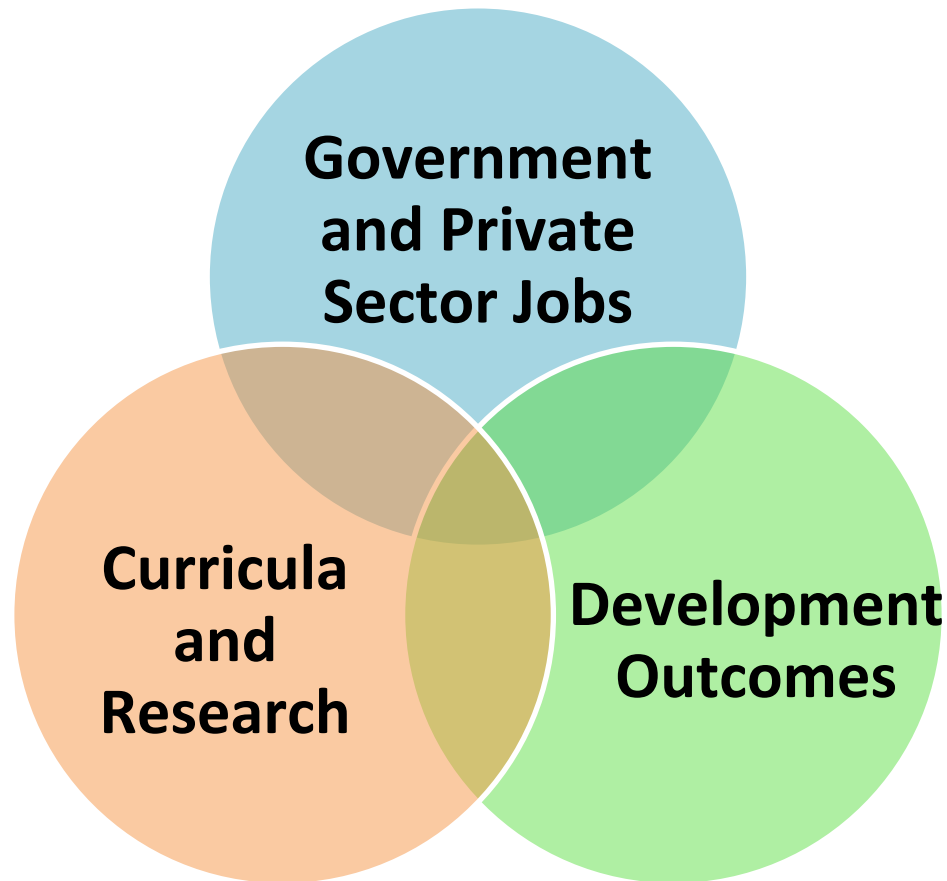
- *Key source of good jobs. Leads to good jobs.*
- **but not enough knowledge and professional mechanisms.**

But what we have:

- **Only 18% of Engineering Graduates work in core sector.**
- **65% of IIT-B Engineers work in service sectors.**

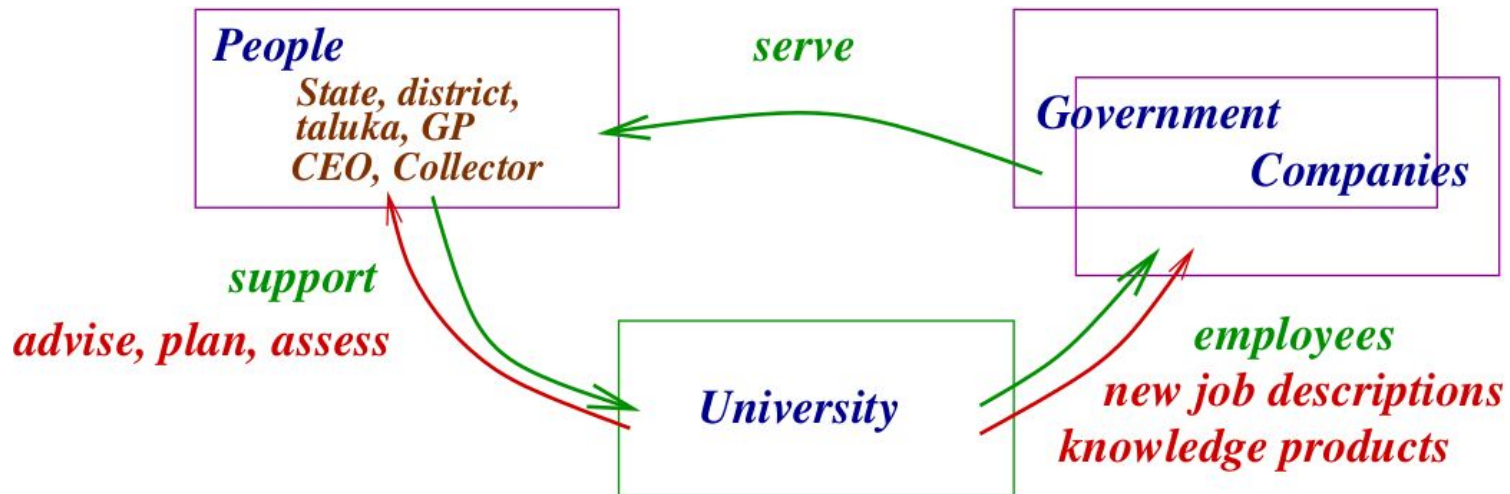
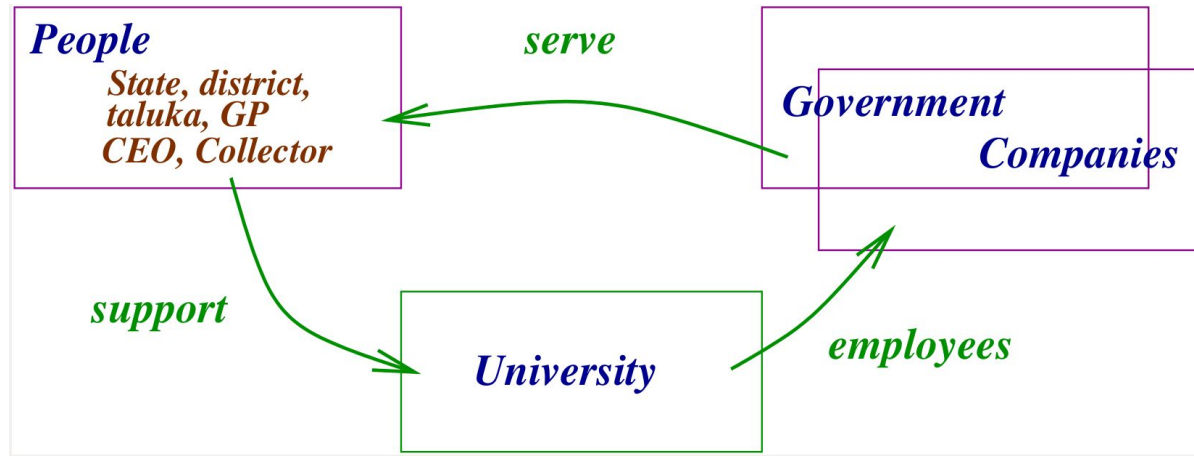
The Solution

Better alignment

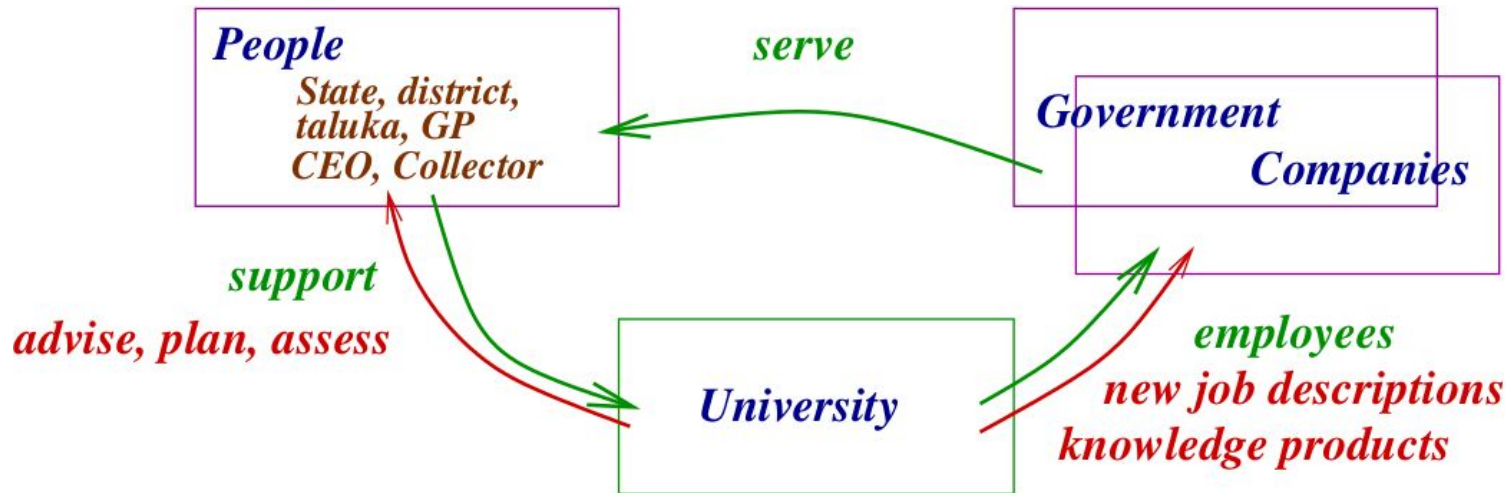


Strategy

The New University: Aiming for Excellence through Relevance



The *New Public* University



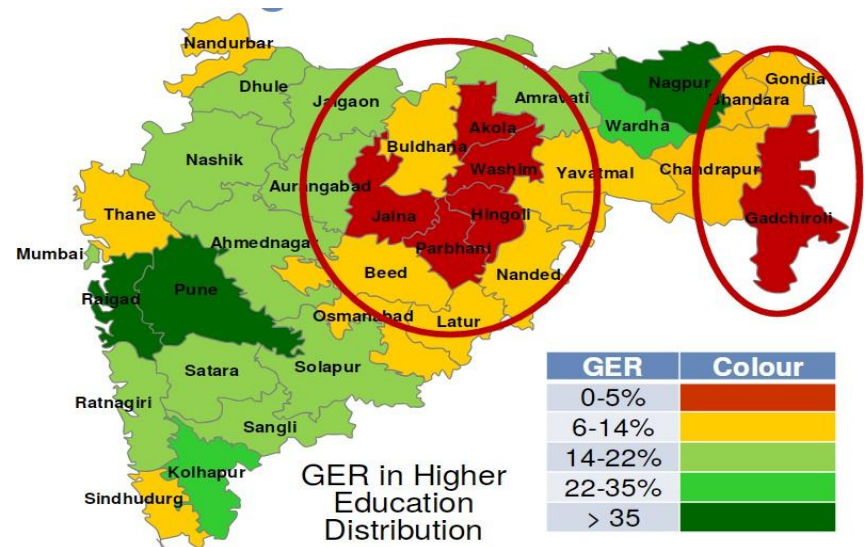
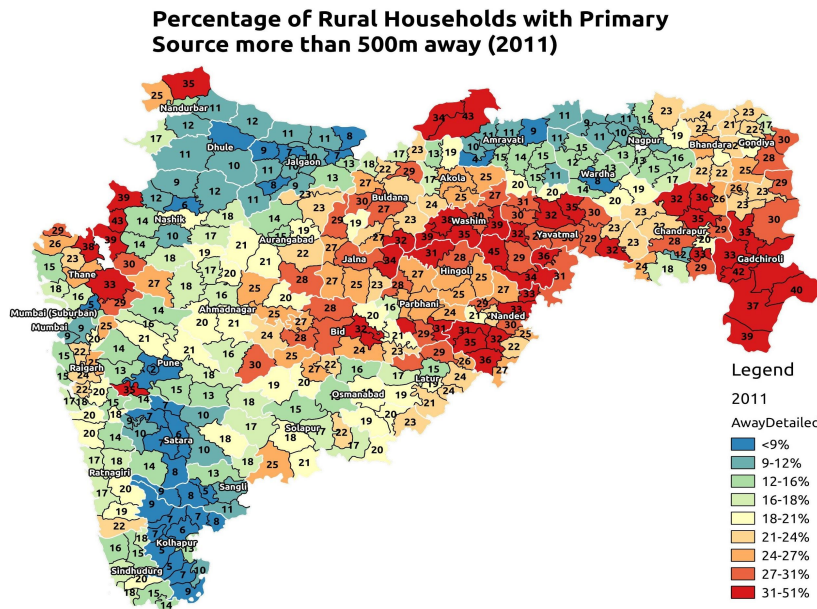
In the Developed World

- Strategic role as civil society
- Right to knowledge - Why, how
- Forging a new culture

The New University

- **Development** as a key driver for research and curricula.
 - Small and medium enterprises, *sadak, bijli, paani*
- **Regional knowledge resource.**
 - New engagements between society, state and market.
- **Solve the knowledge deficit.**
 - New job definitions, new knowledge.
- **Regional Case Study as the lowest mechanism.**

Development Deficit



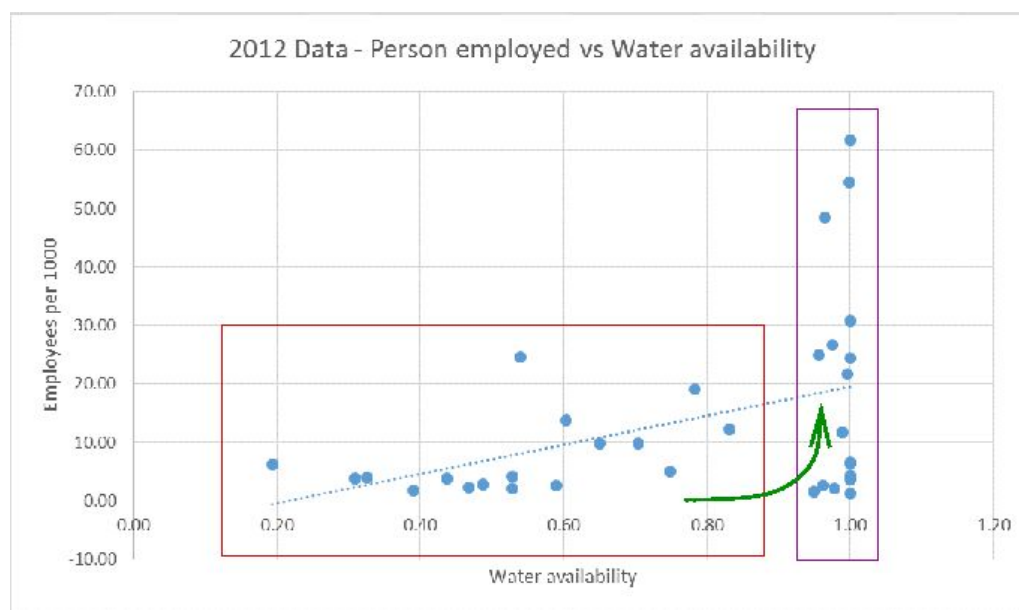
Should this surprise us?

Fetching water and firewood occupies 2-3 hours. Going to place of work, school, college.

Work of great drudgery and poor working conditions.

Another Connection

District-wise Urban Water Availability and Jobs



Better Amenities \Rightarrow More jobs.

Areas of the Future: Water, Sanitation, Planning, Transport.

New Knowledge, New Professions \Rightarrow Better Amenities.

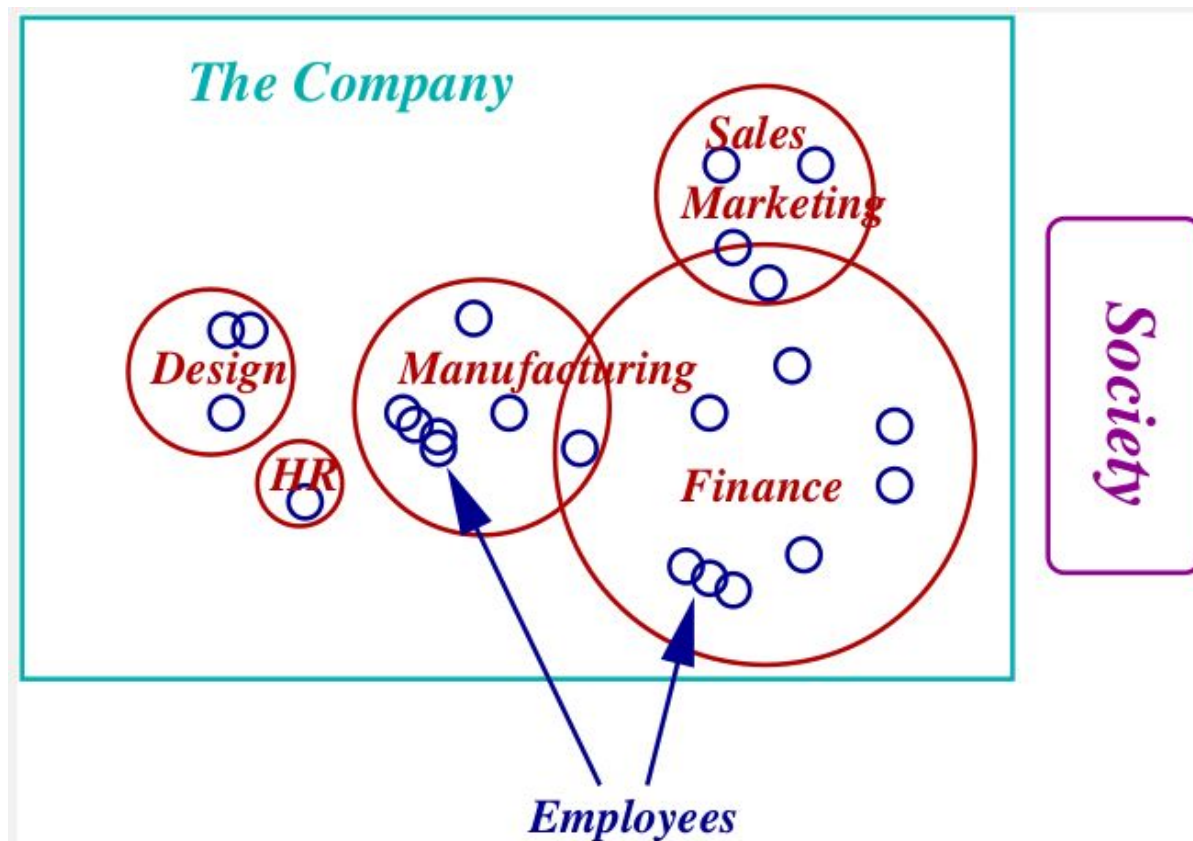
What do other people say?

- Transforming science and technology in India, Economic Survey 2018: State governments should invest in region specific applied research.
- NAAC Curricula: Need based, relevant, interdisciplinary curriculum.
- NAAC Institutional Manual: Curriculum enrichment, customisation and collaboration.
- Preamble, Technology Vision 2035: Nurturing industry institute interaction and linking MSMEs to knowledge institutions.
- AICTE Review Committee Report 2015: Focus on need based curriculum and MSMEs for job creation.
- Draft of National Education Policy 2016: Equity, employability, research and innovation.
- Minutes of the meeting taken by the PM on issues related to S&T (18th July 2017): Focus on applied science research, should be relevant to socio-economic needs.
- AICTE New Model Curriculum 2018: More electives, interdisciplinarity, mandatory internships (social+industrial).

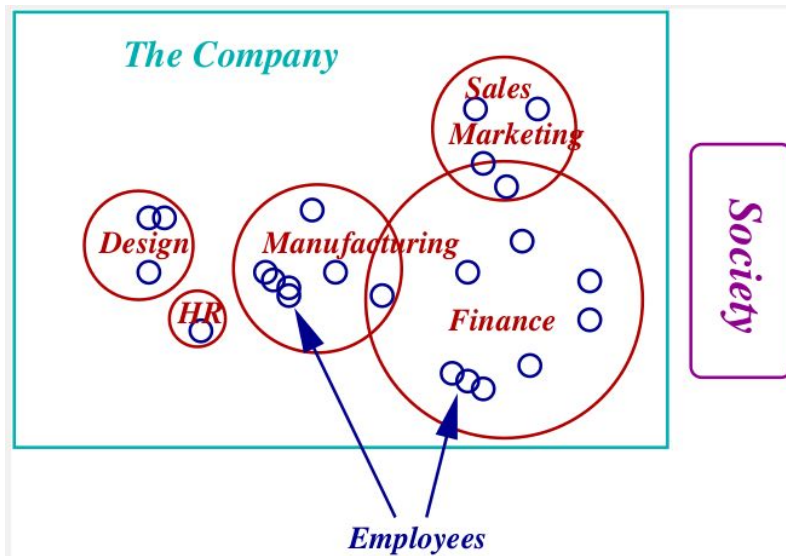
Delivery Model I

How do companies deliver -

Disciplinary training, simulated worlds



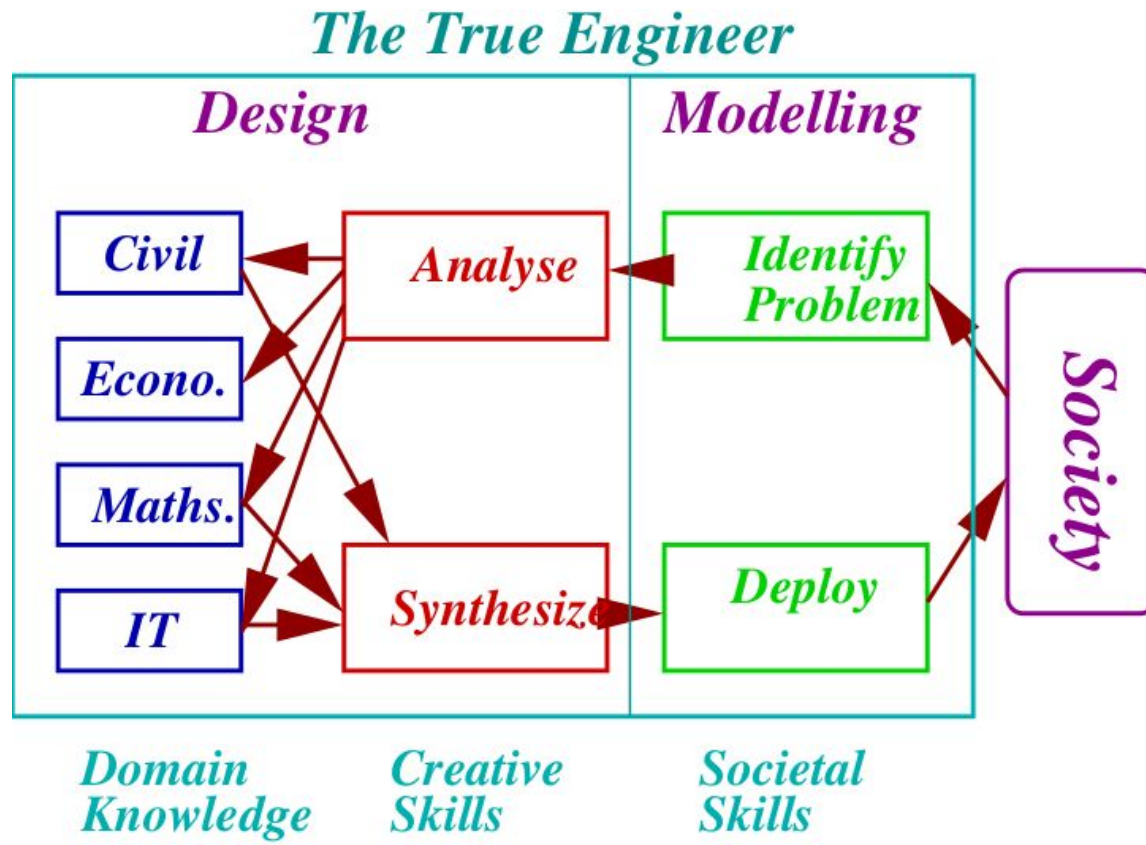
Companies: In what areas do they deliver:



- Where they have business models.
- Where they have expertise.
- Increasingly dependant on borrowed knowledge
- Increasingly addressing needs of the top 10%
- Very hard for small companies and new entrants

- **Development Sectors** - sadak, bijli, pani, urban and rural planning, MSME
- **Our task:** new job definitions, new sectors, trusted entity

How should engineers deliver



Development Sectors - sadak, bijli, pani,
urban and rural planning, MSME

New Training

- Disciplinary knowledge at all level
 - supplemented by interdisciplinary training
- Analysis of real-life situations - regional data, liaison, laboratories, field-work.
- Translation in solution frameworks
- Academic space
- Institute-led mechanisms to interact with society.
 - Development agencies, regional small and medium enterprises, community

The Case-study Approach is a start.

Why the Regional Case-Study Approach?

- Aligns with objectives and mandate of the IITs.
- Provides the student with avenues for developing socially useful capabilities and skills of designing and undertaking a project.
- Enables the institute to develop linkages with regional agencies and to host various dialogues on topics of regional interest.

Vajreshwari-Ganeshpuri Rural Regional Scheme

Feasibility Report on Options for
Scheme Improvement and Augmentation



March 2016

Technology and Development Solutions Cell (TDSC)
Centre for Technology Alternatives for Rural Areas (CTARA)
Indian Institute of Technology, Bombay (IITB)

Examples

Detailed evaluation and monitoring of a few livelihood generation opportunities for tribal village Wawande
(http://10.198.20.100/tdsl/pastreports/sp-ring15/TD390_livelihoodgeneration.pdf)

Mapping and analysis of water and sanitation services availability for gram panchayats in Maharashtra
(http://10.198.20.100/tdsl/pastreports/sp-ring15/TD390_watermapping.pdf)

Karjat Taluka Public Transport:
Infrastructure, Demand and Supply
(<https://www.cse.iitb.ac.in/~sohoni/pastTDSL/TalukaTransportPlan.pdf>)

Typology

- **Template-based** : duplicatable, useful for UGs
- **Regional/Sector based**: suitable for PGs.

Developmental Case-Studies.

Advantages: Familiarity with govt. processes, protocols. Interaction with

- **Assessment and Evaluation.**
- **Failure analysis.**
- **Audit and analysis.**

Sample Regional Knowledge and Practice Areas

Department	Regional Development Practice Areas
Electrical Engg.	Rural grids, Energy audits for villages and towns, Pumps and Motors, Household appliances and their manufacture, Renewable energy systems for households and small enterprises
Computer Sc. and IT	Public transport, Logistics of PDS, GIS and E-governance at the Zilla Parishad, logistics of local railway network and bus stations
Chemistry	Regional water quality, materials and dyes used in local industry
History	Updation of the district gazette. Documentation of the history of public assets and institutions. Creation and documentation of people's narratives and of role models.

Sample Regional Knowledge and Practice Areas

Economics	Analysis of city budgets. Assisting in the preparation and validation of the district economic survey.
Sociology	Supporting GPs in access to development services, monitoring PDS, documenting customs and practices. Documenting linkages with environment, e.g., chulhas and wells.
Civil and Env. Engg.	Low-cost housing, Drinking Water, Watersheds, Irrigation, Sanitation and Solid-Waste
Mechanical Engg.	Chulhas and Cooking energy, Pumps and Irrigation energy, Small engineering enterprises, Solar thermal systems and their deployment
Chemical Engg.	Small food processing industries, Local manufacture of oils and soaps, Equipment for small enterprises, Pollution control and standards at regional level

For the Region

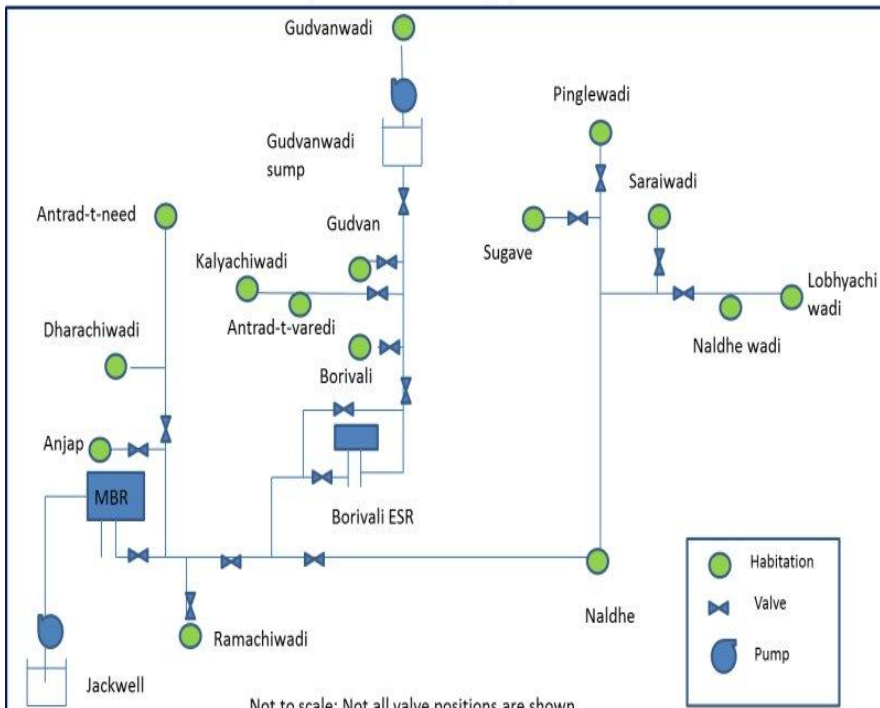
- Agriculture, Irrigation, Sports, Dairy
- **Community Services** - roads, water, sanitation, waste, public transport
- **Social Sector** - health, addiction, migrant labour
- **MSME**: machines, manufacturing, sports goods

All Sectors



Analytic as well as Community

Schematic of infrastructure currently used for seasonal supply

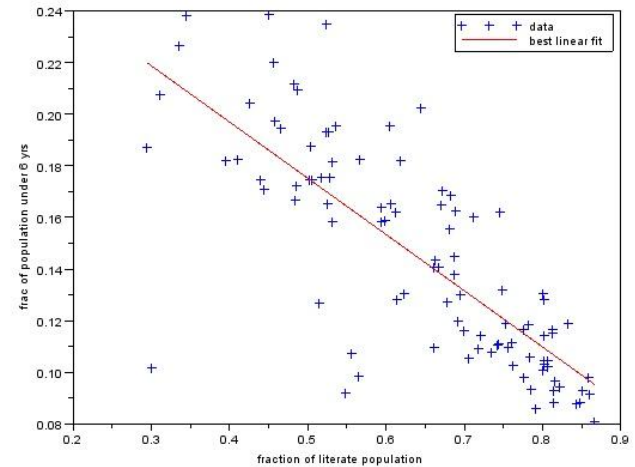
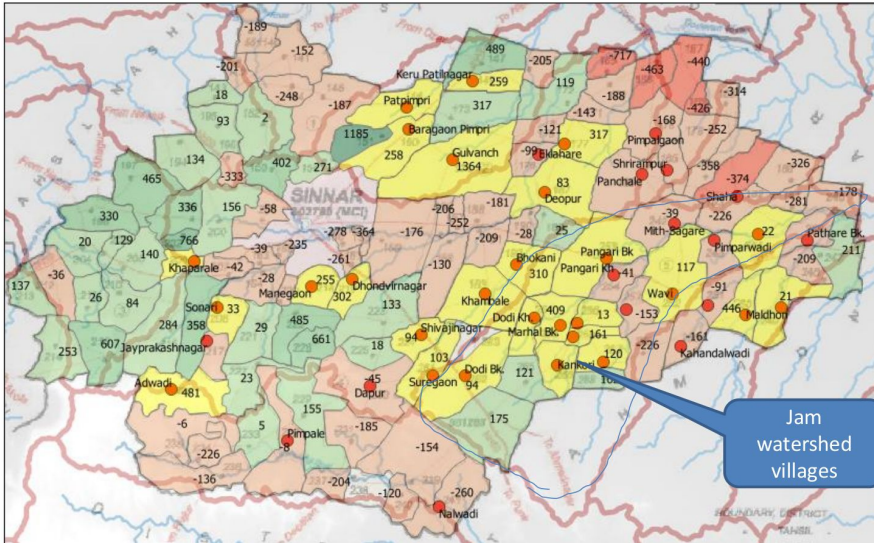


How is a Case-Study done?

- **Understanding the problem from various perspectives**
 - Theory in practice, listening and writing, formulating the problem
- **Preparing and analysing secondary data**
 - Using census and other data sets, analytic frameworks
- **Meeting with various stakeholders and field work**
 - Design of survey instruments, experiments, measurements
- **Overall all analysis and forming the narrative -**
 - supplement knowledge
- **Making the report**
 - Presenting it before stakeholders

Great learnings for the student, new research areas for faculty members, new role for colleges, and beneficial for the region.

Interesting Insights



What is Required to Implement Case Studies?

- Academic space in the curriculum
 - Development Engineering Capstone project
- Training on
 - how to perform field-work, interact with stakeholders
 - procure and use datasets
 - report findings in a given sector
- Logistics
 - Funding for field-work and reporting
 - Data and documents (census, GIS, etc.)
 - Stakeholders and liaison agencies (state government, district administration, community leaders, NGOs, SHGs, etc.)

The Way Ahead

Four-tier system to administer case-studies:

A. Individual level

- Logistics, choice, who-what-where-how

B. The Case-Study Level

- Ownership, training, maintenance of quality, research linkages, regional relevance

C. The Department Level

- Suite of case-studies, laboratories, funding, courses

D. The Institute Level

- Liaison, Overall strategy, affiliated colleges, breadth and depth, funding agencies

The Case Study Level

2-3 faculty members across departments

Objectives, connection with broader society, maintain linkages and narrative

- Maintain Standard templates, exemplary reports, data sets
- Regulate student performance, ensure training and reporting
- Ensure laboratory, travel and logistical support from department/university
- Present/update at regional and state meeting.

The Department Level

- Identify a list of case-studies, practice-areas and practice-based electives that can be implemented in the current academic framework
- Develop 5-10 concrete case-studies every year in each area, done by students through for-credit projects
- Encourage interdisciplinary fieldwork and reporting teams- work with other departments to pool core competencies
- Identify sources of funding for travel, stay, logistics, data and coordination
- Organise seminar series and guest lectures in the identified areas
- Publish the best case-studies in each area on the department website

The Institute Level

- Identify key colleges in each district and establish district extension and research centres in these colleges.
- Create a network of regional colleges in each important research and practice area.
- Hold regular meetings of faculties and students and develop common funding mechanisms.
- Collate high quality case-studies in each area.
- Work with state and district agencies on MoUs, M&E GRs and other instruments of engagement
- Leverage such work with funding agencies
- Provide forum at state and regional level for departments to present their work.

(xix) Each region at the level of District or City or State should develop a Centre of Excellence in S&T. The senior scientists should provide vision and momentum for development of these centres of excellence.

(Action by: All Scientific Departments)

Minutes of the meeting taken by the PM on issues related to S&T (18th July 2017)

Key Development Agencies

- **District Planning Committee**

- Headed by the district guardian minister. Passage of the district budget. Key problem areas. Administration of the district innovation budget. MSRTC, MSEDCL.

- **District Collectorate**

- DIC, Planning Office, PDS, Tanker, Revenue, Forest

- **Zilla Parishad**

- All development departments-water, sanitation, health, roads, NREGA, social sector

- **Local Bodies** - Corporations and Councils

- Utilities, solid waste, roads, local transport,

- **Regional NGOs**

Data Sources

- **Census data - village level, demographic and basic amenities, GIS**
- **NSSO data - sample surveys, each with different focus**
- **District Industrial Council - all formal enterprises, sector of work, employees etc.**
- **District Economic Survey - How the district runs, main sectors, performance, allocations**
- **District Gazette - Geography and History of the district**
- **Departmental data - Agriculture, Water Supply, Irrigation, Health, PDS, Tankers**

Unnat Maharashtra Abhiyan



UMA

A Project under HTE GoM

GR (13th January, 2016)

Objectives

- Reform teaching, curricula and research - topical case studies
- Train future professionals for development objectives
- Make institutions regional resources through key GRs
- Provide mechanism for citizens to approach institutions
- Create academic space for projects and studies in relevant areas

राज्यातील अभियांत्रिकी महाविद्यालये तसेच
तंत्रनिकेतने व अन्य शैक्षणिक व संशोधन
संस्थांमधील विद्यार्थ्यांना राज्याच्या
विकासात सहभागी करून घेण्याची योजना...

महाराष्ट्र शासन
उच्च व तंत्र शिक्षण विभाग
शासन निर्णय क्रमांक : बैठक- ३६११/१६/१५/तांशि २
मंत्रालय विस्तार भवन, मुंबई ४०० ०३२,
दिनांक : १३ जानेवारी, २०१६

संदर्भ :- शासन निर्णय क्रमांक : बैठक- ३६११/१६/१५/तांशि २, दिनांक २८/४/२०१५

प्रस्तावना :-

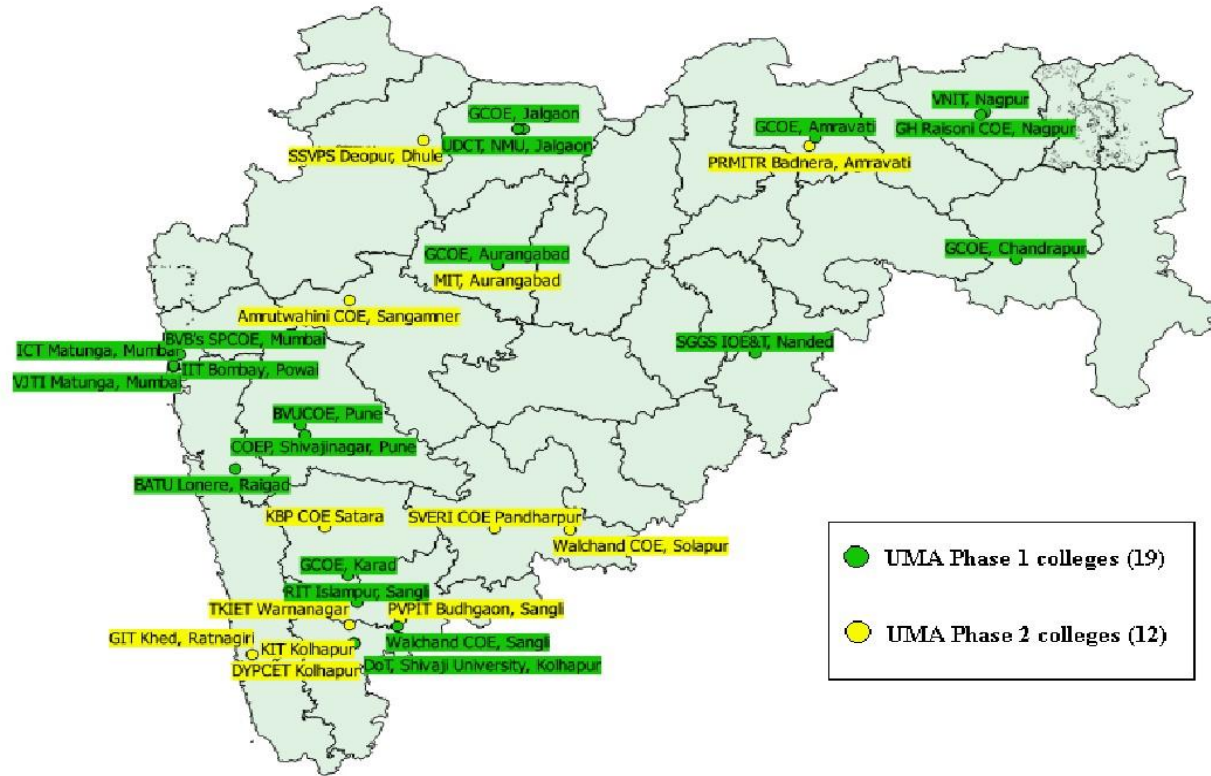
राज्यातील विविध सामाजिक व विकासाशी संबंधित प्रश्नांची संशोधनाद्वारे उकल करून त्यावर अचूक उपाययोजना शोधणे आवश्यक आहे. त्या दृष्टीने विविध शासकीय यंत्रणा व शैक्षणिक संस्था यांच्या दरम्यान विशेषतः सामाजिक व आर्थिक स्वरूपाच्या महत्वाच्या गंभीर समस्यांसंदर्भातील संशोधन वृद्धिंगत करण्यासाठी आणि विविध प्रकल्प निहाय निरनिराळ्या योजनांमध्ये अभियांत्रिकी तसेच अन्य व्यावसायिक अभ्यासक्रमांसाठी शिक्षण घेणाऱ्या विद्यार्थ्यांचा सहभाग वाढविणे आवश्यक आहे.

२. देशातील ग्रामीण क्षेत्रातील विकास कामांमध्ये आय.आय.टी. सारख्या प्रगत शैक्षणिक संस्थांचा सहभाग वाढवून परिवर्तन घडविण्यासाठी केंद्र शासनामार्फत उन्नत भारत अभियान देशातील निवडक, प्रगत शैक्षणिक संस्थांमार्फत राबविण्यात येत आहे. याच धर्तीवर महाराष्ट्र राज्यात देखील अभियांत्रिकी महाविद्यालये, तंत्रनिकेतने आणि अन्य उच्च शिक्षण संस्थांमध्ये सुरु असलेले संशोधन हे अधिकाधिक राज्यातील विविध सामाजिक व विकासाशी निगडित दैनंदिन जीवनातील समस्यांची (उदा. ग्रामीण योजनांतर्गत ग्राम स्वच्छता, शोचालये, सांडपाणी व्यवस्थापन, पेयजल, रस्ते विकास, रस्त्याचे मुल्यांकन करून मजदूतीकरण, जलसंधारण, झंझुन व उर्जा, आरोग्य, दुष्काळ आदी) उकल करून ते लोकाभिमुख करणे गरजेचे आहे. या संस्थांमधील संशोधन तसेच कुशल मनुष्यबळ वापरून सामाजिक क्षेत्रातील विकासाच्या समस्यांवर उचित तंत्रज्ञानाच्या वापराने तोडगा शोधणे गरजेचे आहे. सदस्थितीत अनेक शासकीय, निमशासकीय व खाजगी यंत्रणा व अनेक स्वयंसेवी संस्था विविध विकास योजनांवर ग्रामीण व शहरी भागातील समस्यांवर काम करीत आहेत. तथापि, यासंदर्भात जास्तीत जास्त शैक्षणिक संस्थांचा अशा प्रकल्पात सहभाग वाढविणे व एक संस्थात्मक संरचना निर्माण करणे गरजेचे आहे.

३. उपरोक्त सर्व बाबींचा विचार करून विविध विभागांतर्गत चालविल्या जाणा-या उपक्रमांमध्ये टोस कार्यक्रम सुचविण्याकरिता मा. मुख्यमंत्री यांनी दिलेल्या निर्देशानुसार संदर्भांविन शासन निर्णयान्वये कार्य गटाची स्थापन करण्यात आली होती. सदरच्या कार्यगटाने खालील प्रमुख उद्दिष्ट साध्य करण्यासाठी शिफारशी केल्या आहेत.

१. पारंपरिक संशोधना व्यतिरिक्त उच्च शिक्षण संस्थांमध्ये, त्यांच्या परिसरातील विकासा कामांच्या अडचणी / समस्या/ दर्ज/मुल्य/ शाश्वतता इ. साठी उचित तंत्रज्ञानाचा सुयोग्य वापर करून प्रभावी उपाय योजना सुचविणे व अशा प्रकारची संशोधनाची परंपरा सुरु करून ती जोपासणे व यासाठी एक सक्षम यंत्रणा शैक्षणिक संस्थांमध्ये निर्माण करणे.

C₁



Empanelment- careful, must pass through GoM advisory committee.
Network of trusted institutions.

Target for next 2 years:

- 1-2 engineering colleges/Govt. Polytechnics in each district
- 3-4 Science/Arts college in each district

UMA Work in Pictures



Plastic road (KBP Satara) Cleaning of Krishna River (BVP Pune) Irrigation at Sinnar (CTARA, IIT-B)



Solar Dryers (SSVPS Dhule)



Pencil Inspection & Sorting

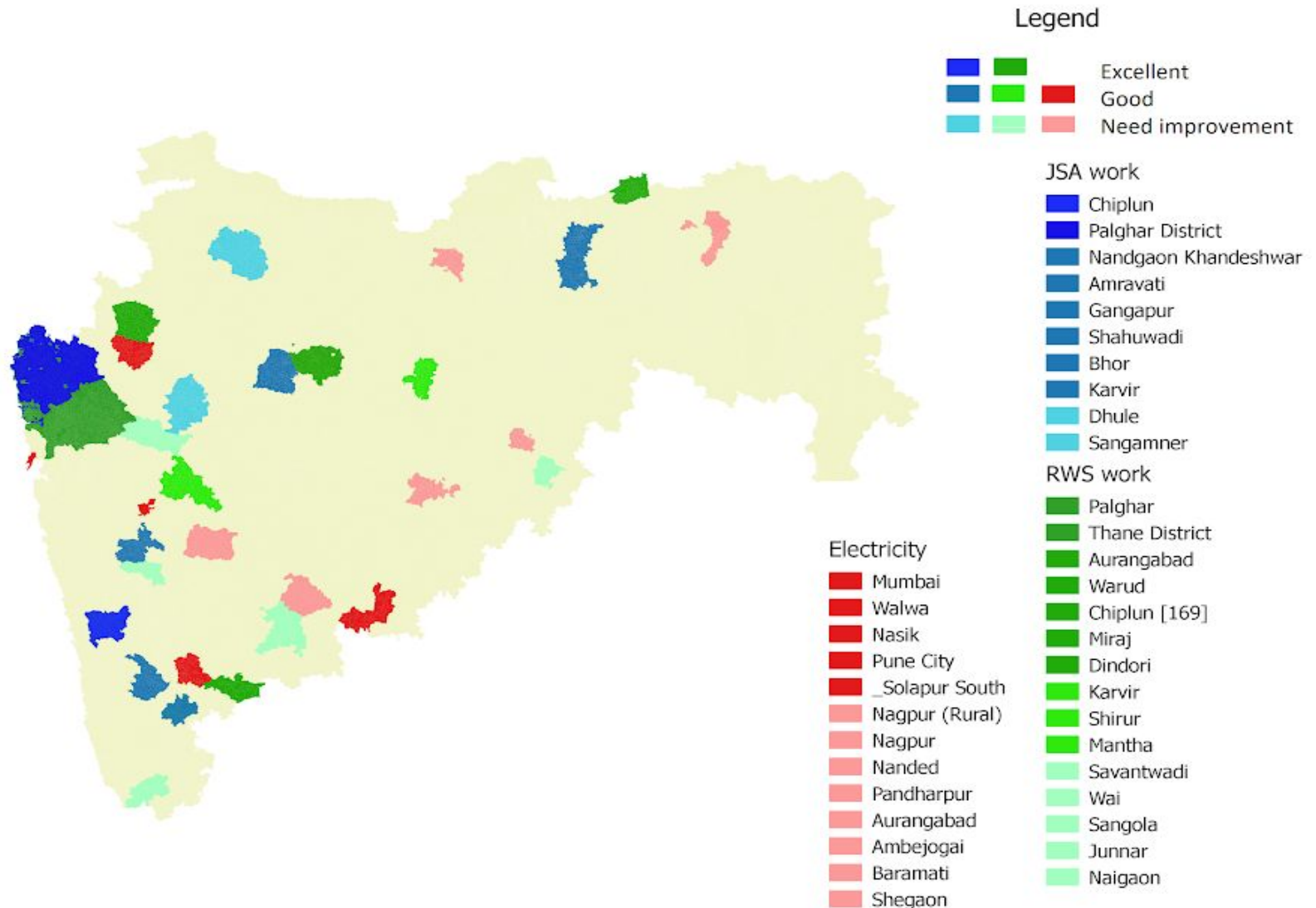
Camlin Pencil Sorter (PVPIT Budhgaon)

UMA Workshops

- Thematic sector - **water, energy, water conservation** - related to development
- **Field problem and community orientation**
- Concrete case-study, **liaison with GoM agency**
- Analysis and reporting
- **Support for 3-4 months from CTARA**

Ensures that students and faculty can do independent case studies

Jalyukta Shivar, Rural Water Supply and Electricity: UMA Colleges and Talukas



JSA and RWS Work Done by UMA Colleges





Hon. CM releasing the training compendium, the outcome of the CTARA-IRAP-UNICEF workshop

The training compendium may be used as a textbook or resource guide by engineering colleges across the country.

References and Attachments

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- Letter to Shri Aseem Gupta IAS, Secretary, RDD (2017, May 19) on empaneling institutions for GPDP work.
- Letter to Shri Subrahmanyam IAS, Add. Secretary, MHRD and Mr. Linden, Lead Education Specialist, World Bank (2016, May 27) on UMA support in TEQIP.

Thanks



Justification of the Strategy

Eminent Authorities and Bodies on S&T and Development

Honorable PM on many occasions:

"Science is universal. Technology must be local"

(During conference of Chairmen of Boards of Governors and directors of IITs at Rashtrapati Bhawan)

"Country needs more applied research to fulfill the requirements of socio-economic priorities"

(During review of Central Government departments)

"Science, technology and innovation are the keys to progress and prosperity"

(During a meeting with top scientific officials)

Eminent Authorities and Bodies on S&T and Development

“8.28 State governments too need to recognize the need to invest in application oriented research aimed at problems specific to their economies and populations. This would both strengthen state universities as well as provide much needed knowledge in areas such as crops, ecology and species specific to a state.”

(Transforming science and technology in India, Economic Survey 2018)

Eminent Authorities and Bodies on S&T and Development

“ Nurturing industry institute interaction in a variety of ways such as; joint problem solving, participation in teaching/learning and industry research park located on the institution campus with structured opportunities for participation of faculty and students, is thus of crucial importance. Incentivizing industry to leverage such an ecosystem to develop new products should be part of the strategy to accelerate national technology capability build up.....**MSMEs have contributed significantly to employment generation as well as exports.** Most of these units are not in a position to invest in R&D. As a result, they run a risk of obsolescence and loss of competitiveness. **Linking them up with knowledge institutions could lead to a win-win situation.”**

(Extract from Preamble, Technology Vision 2035, page 17)

AICTE Review Committee Report 2015

Aligns with Perspective Plan Committee Report

10.11 Of all new employment, only 1% is with the government, 2% with private organised sector and 97% with the private unorganised sector of the Micro, Small and Medium Enterprises (MSMEs). The main thrust of the new educational policy should be to arm the new entrants with skill sets which are in demand. Only thus can we take advantage of the demographic dividend that we are likely to possess.

Academics

- Designing and implementing relevant, need-based curriculum to suit student interests and needs. Curriculum design should take into account contemporary developments in the study area, industry interests and past feedback from teachers, students and others involved
- Data on number of departments available, courses offered, course specific data on pedagogical methods used, quality of content delivered, quality of faculty, opportunities for research are to be collected towards rating.
- Scope to offer inter disciplinary courses can count towards the flexibility of learning experience of students

33.9 **Developing a close connectivity with the Society:** A technical University should take a lead in promoting closer connectivity with the society through

- (i) Final Year projects based on solution of social problems. A technical University has re-imagined and re-designed the infrastructure of 494 villages and many villages have started implementing the designs. The University promotes the activity by giving a small scholarship to the teachers and students working on such projects
- (ii) offering technical expertise for slum removal/ up-gradation studies, for solid waste management, for rain water harvesting studies, for use of green building concepts in public buildings and various other projects relevant to urban and rural needs.
- (iii) studies in governance issues for Governmental organizations, public and private organizations.

Draft of National Education Policy 2016

Aligns with Perspective Plan Committee Report

Reform higher education system in order to ensure equitable access to tertiary education, including technical and professional education, narrow group inequalities in access to higher education, and improve teaching and research, promote innovation and generate new knowledge across all higher education institutions and to enable all enrolled to attain the specified learning outcomes and employable skills;

AICTE New Model Curriculum 2018

Creating Space for Electives

- Reduction in number of credits to enable more time for project based learning, research and innovation
- More weightage given to open electives, stressing on interdisciplinarity
- Mandatory internship
- New elective courses in consultation with experts (for example, Rural Water Supply and Onsite Sanitation Systems)

The revised model UG curriculum in engineering has been designed where number of credits have been reduced to 160 credits with a core comprising basic sciences and engineering having focus on fundamentals, discipline level significant courses and ample opportunity for the students to take electives both from the discipline and cross disciplines, provision for internship to understand the industry requirements, have hands-on experience and to pursue project work in their final year relevant to industry. This will allow the students to develop a problem solving approach to meet the challenges in future. As a major initiative by AICTE, a three week

Prof. Anil Sahasrabudhe , AICTE
Chairman

“Inclusion of mandatory internship, both industry and social, will help engineering graduates have better connect with the industry and society”

Shri Prakash Javadekar, HRD Minister

NAAC Institutional Accreditation Manual

NAAC Criteria align with Perspective Plan Committee Report

1.1 *(A) Curricular Planning and Implementation

The Affiliating/Constituent Colleges have rather insignificant role in curriculum designing and development. They adopt the curriculum overview provided by the respective universities. Each college operationalize the curriculum within the overall frame work provided, in one's own way depending on its resource potential, institutional goals and concern and so on. That is, each college visualizes the way the curriculum has to be carried out – activities, who, how, when etc. This process makes each institution unique and reflects on the concern of the college for quality in the form of values emphasized. sensitivities focused on. etc.

1.3 Curriculum Enrichment

Holistic development of students is the main purpose of curriculum. While this is attempted through prescribing dynamic and updated curricular inputs, the HEI is expected to have provision for added courses and activities which may not be directly linked with one's discipline of study but contribute to sensitizing students to cross-cutting issues relevant to the current pressing concerns both nationally and internationally such as gender, environment and sustainability, human values and professional ethics, development of creative and divergent competencies. A progressive university would provide a wide range of such “value-added” courses for students to choose from according to their interests and inclinations.

3.7 Collaboration

Through collaboration the HEIs can maintain a closer contact with the work field. It helps keep the academic activities in the HEI in a more realistic perspective and also expand the scope of learning experiences to students. Collaboration can be sought with academic institutions or industry or other agencies of professional and social relevance. The range of activities could include training, student exchange, faculty exchange, research and resource sharing, among others. For making collaborative endeavor impactful it is necessary there is a formal agreement or understanding between the institution and other HEIs or agencies for such activities.

NAAC Curricula

Curricular Aspects: Case Presentations

Considering the analysis of the assessment reports by NAAC, Curricular Development and Transactions are important considerations, which we need to focus our attention in reforming the higher education.

The important initiatives we need to dwell on are:

1. Development of need based and socially relevant programmes.
2. Relevant curriculum in a fast changing world.
3. Emerging areas in innovative and inter disciplinary areas have to be evolved.

Key Indicator – 1.1 Curriculum Design and Development (50)

Metric No.		Weightage
1.1.1 Q1M	<p><i>Curricula developed /adopted have relevance to the local/ national / regional/global developmental needs with learning objectives including Programme outcomes, Programme specific outcomes and course outcomes of all the Programme offered by the Institution</i></p> <p>Write description within a minimum of 500 characters and maximum of 500 words</p> <p>File Description</p> <ul style="list-style-type: none">• Upload Additional information• Link for Additional information	20

Minutes of the Meeting taken by the PM on issues related to S&T (18th July 2017)

(i) Many times, while taking up new projects, the relevance and appropriateness of the location is not taken into account. The Scientific Departments should be conscious of such relevance, usefulness to the society and overall national interests while formulating projects and deciding on their locations.

(Action by: All Scientific Departments)

(ii) It has been observed that due to misplaced priorities and lack of understanding of local problems, our new technologies and products are not very relevant to our societal needs. It is therefore the responsibility of the Secretary of each Department to ensure that their projects are supplementary to the priorities of the Government.

(Action by: All Scientific Departments)

(iii) All the Ministries/Departments and Government Agencies need to change the thinking and orientation for adapting to new technologies, while implementing projects. The Scientific Departments should work in tandem with the developmental

Ministries and Government agencies to support and provide technological solutions to their problems.

(Action by: All Deptts.& Ministries/All Scientific Departments)

Minutes of the Meeting taken by the PM on issues related to S&T (18th July 2017)

(iv) Country needs more of Applied Science Research to fulfil the requirements of socio-economic priorities. Therefore, Scientific Departments should keep a judicious balance between Applied Science Research and Fundamental Research while taking up research projects. **(Action by: All Scientific Departments)**

(xxi) As instructed on earlier occasions by the Prime Minister, Scientific Departments were once again requested to channelize their resources and activities to meet the socio-economic needs in the fields of Health, Water, Sanitation, Waste Management, Smart Cities, Solar Energy, Irrigation, Food, etc. **(Action by: All Scientific Departments)**

Thank You