A
Proposal
On

"Establishment of Technology Development Centers in Engineering Colleges"

By

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Contents

Foreword

1. Introduction

The purpose of exercise leading to this report was to explore how Engineering colleges in India can collaboratively approach to improve the quality of learning, Promote In-house R&D activities and for generating industry ready pool of Engineers.

This report provides information about collaborative activity that aims at channelizing efforts put by engineering colleges for humanizing fineness. This report:

a. Discusses the factors that underlie the need for improvements in present engineering education.
b. Provides examples of ways in which colleges can collaborate to improve the quality of education, between and among colleges, and with external agencies.
c. Identifies and comments on issues arising from the collaborative initiatives; and
d. Identifies ways forward in using collaboration to improve quality of education.

This report is based on:

a. Desk research into Industry expectations from budding Engineers.
b. Visits to few engineering colleges and interviews with staff at various levels.
c. Conclusions of Interviews with staff in other agencies and Top level management executives from industry.

The term *collaborative* is used broadly in this report to convey joint activity, whether within a college or across two or more colleges and with external agencies. The essence of collaboration is sharing views and working together. *Collaboration to improve standards of organization as well as students* includes any collective activity by our staff to address various productivity issues. It signals that responsibility for the quality and effectiveness of technology development is held at team, corporate and sector-wide levels.

2. Context: Factors underlying need for development of this plan

There is an urgent need to upgrade the quality of engineering education in India, to produce engineers of professional excellence, and to prepare our engineering students for better career opportunities.

In brief our plan is "Making Graduates more Employable and self-assured" by imparting required level of technical expertise as well as innovativeness while in their graduation.

Scenario of Present Technical Education

Presently, Indian engineering colleges produce six lakh graduates, per year. Large percentages of them are neither engineers of the expected confidence, nor well-groomed young citizens capable of facing the world with confidence.

Low competency coupled with lack of employment opportunity forces 65 to 70 per cent of these graduates to languish as unemployed or underemployed engineers. Year after year their number will multiply. Unplanned expansion of engineering seats and continually lowering the quality of education are the causes of this appalling situation. This situation forced us to come out with a plan that can at least increase technical proficiency in a Graduate to survive in the present competitive world.

Narrow Access and Inadequate Participation

Except for a few colleges run by major industrial houses, such as P.S.G., Coimbatore, and BITS Pilani, and those run by Central as well as State governments, such as IIT's and NIT's, most institutions do not have adequate training facilities or industry collaborations to provide training and project work. This deficiency should be removed.

Limited Guidance and Support

Engineering colleges are facing difficulties in retaining talent pool of Expert training faculty for in house guidance and support which is really creating a hard time for the development of Technology. At the same time industries are feeling little insecure to set up their technology development wings in

engineering colleges as they do not possess the required expertise to handle the projects.

Findings from our previous observations

With our best knowledge from a survey on Collaborative initiatives taken up by few US universities for the technology development, we can list down the following observations.

a. The institution standing forefront in the technology development is offered funding by the Industrial sector for carrying out their projects in the institute.
b. Increases the count in number of industries knocking door for placements.
c. Enhances confidence levels of students about their career and keeps them more focused on what they are mostly interested in.

3. Issues related to collaborative initiatives

How the initiative arose

Graduation, from any college, is definitely not the end of story. For hundreds of thousands who emerge out of these institutions, it is just the beginning of a life-changing process called "job search."

To help their students tide over this tricky phase and land good placements in reputed firms, colleges often arrange campus recruitments. But are these events impressive enough to please the industry's demands for quality, job-ready graduates?

Faced with a "talent crunch," the companies are not happy about the products of our institutions. Their solution: **Hire and train**.

The industry spends a fortune on training fresher. But then, what about the colleges that are supposed, at least theoretically, to take on that role? "There is a **disconnect** between the Engineering schools and industry. Of the 6.0 lakh Engineering graduates who come out of the colleges in this country, only 20 per cent are ready to be employed".

Industry expectations are, of course, high every time a new recruit joins a company. But is this justified? We feel that the engineering institutions had to reach out to the alumni and corporates to understand the industry requirements. "Of course, the industry expectations for delivery are high, right from Day One." With this vision in Focus we evolved to promote **industry - institution** interaction for the betterment of opportunities for students.

How the initiatives are to be implemented

Firstly the colleges must identify the areas in which quality has to be improved and must carry out certain initiatives by setting up the objectives. From our observations we would like to suggest the following areas in which quality has to be improved.

Qualitative improvements are needed in

(i) Determination of advanced education and training capacity
(ii) Scope and understanding of students
(iii) Facilities for project work and practical training and

(iv) Extra curricular activities and personality development.

College management can individually or in **partnership**, set up well-equipped industrial workshops, to serve as practical training centers for engineers, as well as skill development centers for training and producing technicians, who are needed in large numbers and are always in short supply in our mega project sites. These centers can also execute project prototype development and execution orders on a commercial basis for industries and mega projects.

Objectives of the Initiative

a. To create an environment in which engineering institutions selected under the Program can achieve their own set targets for excellence and sustain the same with autonomy and accountability.
b. To support development plans including synergistic networking and services to community and economy of competitively selected institutions for achieving higher standards**.**
c. To improve efficiency and effectiveness of the technical education in institutions selected under the Program.

4. Impact of the collaborative initiative

Changes and Benefits

This initiative can stimulate extensive thinking and discussion on learning new technologies, particularly in projects where the students and their teachers can identify and analyze the problems to be tackled and develop strategic solutions jointly.

Participants can experience a change of culture towards greater openness, experiment and development in their work. Many participants feel good, especially where there was a climate of encouragement and reassurance in their own colleges. A positive dynamic in project groups can help to stimulate innovative thinking.

This initiative can promote a significant change of attitude towards emphasizing the diversity of learning needs rather than learner performance in general.

Sharing and discussing experiences and ideas with others can support professional development. Sharing within a college, for example through observation, team teaching, and discussion with peers, mentors or managers, can carry benefits both to the individual and to the consistency of quality across the college students group. Sharing across colleges and across disciplines increase exposure to different ideas and perspectives and promote the sharing of good practice and expertise. Sharing and discussion among student groups promote teamwork and ownership of problems and their solutions. There were also benefits in terms of increasing confidence, for example, to disseminate good practice, run workshops for colleagues and evaluate practice objectively.

5. Technology Transfer Issues

Fields of Interest

With the survey that we have conducted for about a year we could come to a conclusion in writing down the technologies that are really happening in the industry. And fortunately our Technical team managed mastering those. Various Fields of Interest for this project include:

1. Embedded Software/ Hardware Co designing
2. Handheld / Mobile Computing (Pocket PC / PDA/ Smart Phone Applications)
3. Robotics and Artificial Intelligence
4. Linux OS internals and Device Drivers
5. GSM/ GPRS/ CDMA based Applications
6. Bio-medial Instrumentation and Telemedicine
7. Industrial Automation and Process Control
8. Power electronics
9. Access Control and Security
10. Digital Signal Processing (Speech / Audio and Video)
11. VLSI Designing
12. Embedded Networking
13. Real time operating Systems
14. Blue tooth, Zigbee, Wi-Fi and other emerging Wireless Technologies.
15. Software Technologies like .NET , Java, Testing Tools and such others.

In House Domain Expertise Development

At Technology Development Centers we strive a lot to improve the domain Expertise in various above described fields of engineering. This could help engineering colleges to augment the level of expertise they have at present. It ultimately leads to increase in the standards of education that they currently encompass.

Plan of Action and Strategic Model

Plan of Action:

To implement the proposed model for the betterment of Technical Education we planned to carry out the series of activities as mentioned below.

1. Identification of Potential Educational Institutions for launching this program. The institutions accepting for the establishment of TDC should support us in getting the required space and other amenities in their premises.
   Estimated Deadline: _____

2. Setting up required Infrastructure with the support of the hosting Institution.
   Estimated Deadlines:
   Setting up of Infrastructure - _____
   Deployment of Other Equipment - _

3. Deployment of our Technical Faculty in the hosting Institution.
   Estimated Deadline: _____

4. Training the assigned Faculty members (3 in Number) of Hosting Institution in various fields of interest mentioned above.
   Estimated Deadline: _____

5. Reaching out to students and providing them the required training for carrying out the projects to be assigned.
   Estimated Start Date: _____
   Estimated Deadline: _____

6. Advanced Training to the assigned Faculty members of Hosting Institution in various fields of interest mentioned above.
   Estimated Start Date: _____
   Estimated End date: _____

7. Project assignment and other strategic moves for execution of the same.
   Estimated Start date: _____
   Estimated Deadline: _____

Strategic Model:

After many brainstorming sessions with the institution as well as in-house experts we came out with the following model so as to make this much viable for colleges to welcome.

This model is designed around two working entities, the hosting Institution (Engineering Colleges accept to host this initiative) and the PTF. The proposed roles and responsibilities of each entity are as follows.

The Roles and Responsibilities of Hosting Institution:

- To provide required space and infrastructure to conduct activities proposed in the model.(The details of required infrastructure is attached in annexure I)
- To provide sufficient funds for procurement of various Laboratory equipment for the functioning of this activity. (Details of required funds is attached in annexure II)
- To motivate its staff members to actively participate in the activities Proposed by us and to suggest us ways to implement this initiative in a better way.
- To monitor and generate feedback reports on the activities for the betterment of the program.

The Roles and Responsibilities of PTF:

- To prepare action plan and Activities schedule
- To develop required Documentation and Material for carrying out this activity. The Material includes all the required content for execution of projects and other R&D activities.
- To provide Required man power for carrying out the activities
- To train staff members of Hosting institutions in various fields of interest mentioned in the above description.
- To monitor and report the progress of activities proposed at Technology Development Centers and do the necessary for improvements.
- Industry to reach out and Technology transfer from various Industries to the hosting College.
- To conduct Exhibitions in the Hosting Colleges for Show casing the Technology development activities.

To implement and demonstrate various Technologies for the improvement of the Institution. Some of the projects that we are planning to demonstrate include:

a. Institution Automation for Increase in Energy Utilization Efficiency
b. Biometric / Smart card based Automation for student Transactions like : Library, Tuition and Other Fee, etc
c. Establishment of Kiosks helpful for students and Staff to access their details in the college with Biometric integration.
d. Deployment of high end Security and surveillance system in places where ever required in the colleges (Like Examination Cell, Hostels and few other sensitive areas).

Note: The above mentioned Projects will be implemented by our technical team with the help of Staff and Students of the hosting institution.

6. Conclusion:

The drive to improve technology orientation through collaborative approaches generally arose from the need to improve low retention and achievement rates which will in part attribute to the colleges' success in widening access to learners with diverse learning needs.

1. Projects will generate staff motivation, ownership and enthusiasm.
2. Colleges might develop ways of embedding focused projects and initiatives into existing systems.
3. For the students, nothing could be more valuable than advice from experienced industry personnel themselves, which they can get through this initiative.
4. and many more……

Here's how we would like to map the areas of improvement for the students all geared up for a job as well as Interest towards Technology Development.

"We await your response to implement this initiative in your esteemed Organization"

7. Annexure I:

Space and Infrastructure requirements:

Note: 1. The following are the details of the infrastructure required for the establishment of Technology Development Centre. The below mentioned facilities are to be provided by the Hosting Institutions.
Note: 2. The below mentioned requirements can be used to conduct sessions for 50 members at a time.

1. A class room setup with LCD projector with a seating for about 50 members.
2. Laboratory with following Infrastructure:

    a. Personal Computers --- 15 in Number

The personal computers should have internet connectivity along with a Back up UPS for at least a period of 30
minutes. Details of required PC:
P4 /Equivalent Processor, 1 GB RAM, 80 GB HDD, DVD Combo drive, USB 2.0 Support, 17" Monitor, built in Wi-Fi Card.

    b. Computer Tables for the placement of PC's --- 15 in Number
    Sitting Chairs --- 40 in Number

As we are planning to use the same table for Embedded Tools as well as for the placement of PC we require the one with the following specifications.
The proposed size of the computer tables: 5.5ft Length X 2.5 ft Breadth

3. Power Supply, Lighting and other basic amenities in the class room as well as Laboratory.

The total Estimated Expenditure for development of this facility would be as follows:

For PC: 15X10, 000 = 1, 50,000 /-
Towards Required Seating and furniture: = 1, 25,000/-

Total Expenditure towards Infrastructure: 2, 75,000/- INR

8. Annexure II:

Requirements for Laboratory Setup:

The following are the required equipment for setting up advanced Computing Laboratory. With the proposed system the students as well as staff can experiment on various issues related to cutting edge Technologies. This laboratory with the proposed equipment can serve various R&D projects to a greater extent.

Table 1:

The equipment described in this table will be already present with in the Engineering Institutions and if the hosting organization is interested in purchasing these the below given table could give them an idea.

S.No	Description	Qty	Estimated Cost / Piece	Total Cost
1.	Regulated Power Supply (0-30 V variable, 3 A, Dual Channel)	6	5,500/-	33,000/-
2.	Function Generator	2	6,000/-	12,000/-
3.	DIGITAL CRO (30 MHz)	4	45,000/-	1,80,000/-
4.	Digital Multi meter	15	3,000/-	45,000/-
5.	Discrete Components	Not Applicable		50,000/-

Estimated Total1: 3, 20, 000/- INR

* This is an optional investment to the hosting Institution.

Table: 2

This table details about the required laboratory Equipment for conducting various training sessions and for execution of various projects.

S.No	Description	Quantity	Estimated cost/Piece	Total Cost
1.	89C51 Development Kit : (64 K Flash Program ROM, 2k RAM, 512 K EEPROM, RTC, SPI, LCD, ADC, PPI, RS232, RS485 and few other interfacings)	10	4,500/-	45,000/-
2.	PIC 16F877A Demo Board (RTC, I2C, ADC, LCD, RS232, RS485 and many other possible Interfacings)	5	5,400/-	27,000/-
3.	Rabbit 3000 Core Mother Board with RCM 3720 core module and Dynamic C Compiler. Ethernet Connectivity along with RS232, RS485, RTC and few other Interfacings	5	9,000/-	45,000/-
4.	ARM 7(Philips LPC 21XX series)TDMI based Development board with CAN and other interfacings	5	5,200/-	26,000/-
5.	ARM 9 core with (Atmel based Microcontroller board) Linux Kernel Support along with USB, Ethernet, Serial and Parallel I/O port support	2	21,000/-	42,000/-
6.	WinCE based mother board	2	18,000/-	36,000/-
7.	GSM/GPRS Modem AT command Supporting	4	5,600/-	22,400/-
8.	Global Positioning System Kit	3	6,500/-	19,500/-

9.	RF Modems (433.39 MHz/ any ISM band)	6	2,200/-	13,200/-
10.	Zigbee Development Kit Maxstream / Atmel make	6	3,600/-	21,600/-
11.	Finger Print Sensor based Development Kit	2	8,300/-	16,600/-
12.	Smart Card Development Kits along with 1K, 4 K memory cards each 5 in Number	2	5,200/-	10,400/-
13.	Robotic Trainer Kit (with C51 Core CPU on board) with Line following, Ultrasonic and Infrared based obstacle detection sensors.	3	9,500/-	28,500/-
14.	RTOS (Micro C OS II) supporting hardware for PC interfacing.	3	4,500/-	13,500/-
15.	DSP starter Kit from Analog Devices	3	8,500/-	25,500/-
16.	FPGA Kit from Xilinx (Sparta III) Starter Pack	3	12,000/-	36,000/-
17.	TI's DSP development Kit	2	12,500/-	25,000/-
18.	Microcontroller Programmers For 8051, PIC ,AVR etc	2	13,200/-	26,400/-
19.	Sensors: Temperature, Humidity, Water Level, Ultrasonic, PIR, Light ,Gas leakage, Smoke, Barcode reader, Door open, Glass Breakage, Fire etc			1,00,000/-
20.	Visual Studio Student Version For carrying out .NET projects as well as others related to pocket PC and Windows Mobile		Free	Can be brought as a contribution from Microsoft

Estimated Total2: 5, 79,600/- INR

Table: 3
This table details about the required staff and compensation towards their services

S.No	Description	Number Required	Service cost for entire program
1.	Staff members proficient in various technologies. These faculty members have to stay in hosting institution as well as at our facility.	2 in Number	12monthsX18,000 X2 4,32,000 /-
2.	Web portal Development, Work Shops, Exhibitions, Competitions etc	---- NA ------	3,00,000 /- for the entire academic year.
3.	Guest Lectures and towards Program Manager	For delivering about 20 hours of Guest Lectures from Industry Experts.	50,000/-

Total Expenditure for manpower = 7, 82,000/- INR

Consolidated Expenditure for the entire program:

Total Expenditure towards Infrastructure: 2, 75,000/- INR* (Optional)
Estimated Total1 (Basic Lab equipment): 3, 20, 000/- INR* (Optional)
Estimated Total2 (Technology Lab Equipment): 5, 79,600/- INR
Total Expenditure for manpower: 7, 82,000/- INR

Total amount in INR: 19, 56, 600/-