Bridging the Industry—Academia Skill Gap

A Study on Engineering Institutes in India with Special Emphasis on Computer Science Stream

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ABSTRACT

India is known as country of intellectual. It has produced luminaries in every field be it pure sciences Engineering, space, life sciences, political thinking, law, IT industry, astronomy etc. Kautilya, Patanjali, Hargovind Khurana, C.V. Raman, Rabindranath Tagore, Homi Bhabha, A.P.J. Kalam, Kalpana chawla, Sundar Pichai (Google), Narayan Murthy (Infosys), Azim Prem Ji(Wipro), Ratan Tata, Satya Nadela, AryaBhatta (Astrnomer) are some of the names who have brought laurels to the country. Indian Institute of sciences Bengaluru has been donated by an industrialist Tata's to Govt. of India. It is a premier research institute.

In earlier times the number of industries and technology were less or limited. With time the technology has become very advanced and industries also increased but academic system is not kept pace with upgradation in technology and system. India's education system churns out 26.5 millions of graduates which includes around 1.2 million with engineering degree. A large portion of it remain unemployed or at least start as unemployable till they somehow find ways to get themselves skilled and hence get employed. 8/10 engineer grades are unemployable. In the Indian industry it is observed that the course curriculum taught in many of the engineering colleges does not prepare the students to start effectively at the level that the organizations require. As a result the organizations that recruit these fresh graduates spend considerable time, money and other resources to bring their skills to the right level for them to become productive. The cost to company for this endeavor very frequently goes over Rupees 1, 00,000 per graduate in terms of salaries for non-productive period, infrastructure cost for this period, training cost and other costs for supporting functions. With this present scenario in mind, this paper is an effort to highlight a number of current and future initiatives aimed at gearing up and accelerating interdependence between academia and industrial prospects in India by laying special emphasis on Skill Development, Practical Knowledge/Research and development initiatives, building centers of excellence and attractive packages to allure competent faculty.

INTRODUCTION

Necessity drives inquisitiveness. Industry and academia collaboration is must for the overall development of the youth and the country. Industries demands new and developing skills so that they can compete in demanding global market. However graduates from engineering institutes are coming in Lacs but the sizable number of students remains unemployed due to gaps in skills and expectations.

Lot of investments and planning is done by Government sectors in terms of skills required by industry vs number of collages vs specialized subjects and invest cost to enable these institutes to deliver better results. However it is inadequate to address needs of corporate world. Government, Industry and universities should be able to coordinate to minimize the cost, time and the waste so that they work in same direction and with similar perspective.

SKILL GAPS

It is not that the number of collages in India is less or there are fewer opportunities to grab. The numbers of collages are increasing vs quality is deteriorating. Today's industry looking at innovative solutions in minimum cost and less effort.

From my personal experience as senior manager in IT company when recruiting fresher from institutes I observed that when students are given a real time scenario and asked to create programs for the same they are unable to make that. The mindset observed that, they understand only the code or programs which are taught in curriculum but not able to apply the same in actual scenarios. They understand them conceptually but applying to real life scenario is lacking as they have actually not seen the actual implementation of the subjects that they are studying. Likewise in Computer science there is a subject on data structures and students of institute learn it literally by definition and they never know where it will be actually applied in real world. Expression of students to explain the solution is also lacking communication skills.

In the organization we have skill up programs where we are investing a considerable amount of time and effort from trainers to enable them to work on live projects. Also it's been seen that coding guidelines which is the first basic step in software's for writing the code that they are unable to understand. Though they have studied and know about it but not able to visualize practically.

Gaps between industry and Academics

1. Curriculum is not keeping pace with current technology and demand of industry. It is static in nature.
2. Focus of universities and institutes are more on academics and less on practical application
3. No Exposure of industry is given for setting up real life expectation in terms of salary, timings and Mobility.
4. Mind set of students that knowledge earned from degree is sufficient to survive in corporate world
5. The Faculty is demotivated and it affects education quality.
6. Even though practical's or project work is there in current curriculum but it is not evaluated on quality parameters Vis a Vis industry if assign any project to an employee it will be measured for quality and productivity in the given time line.
7. Also students does not give much value to practical because the % of marks assigned for practical is less than theory.
8. Soft Skills development are not covered in curriculum of many institutes.
   (a) Attitude, commitment and ownership
   (b) Reasoning and learning ability

(c) Communication skills
(d) Team spirit
(e) Innovation skills.

DEMAND OF INDUSTRY

As soon as student comes out of collage he aspires to gain a lot from his qualification. But actually that is not the case. The rejections in placements happens because of communication gap between employer and perspective employee. The skills which industry is expecting are as follows:

1. Core Skills:
   (a) Knowledge on specialization subject
   (b) Practical knowledge of subject.
2. Soft Skills
   (a) Attitude, commitment and ownership b. Reasoning and learning ability
   (c) Communication skills
   (d) Team spirit
   (e) Innovation skills

Organizations are expecting employees to understand and imbibe the company values and to be result oriented.

The Pie chart below shows the skills desired by employers as per India skill report by Wheebox

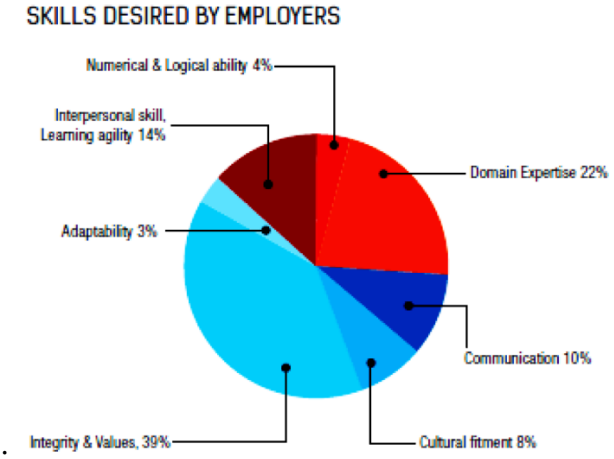

Fig. 1: References [3]

WHY DISCONNECT

The Institutes work more on distribution rather than generation of knowledge:

- Marks distribution between laboratory/Practical and theory for a subject is ~80:20.
  Students always focused on the theory part to score better grades. Also all competitive exams are focusing on theoretical knowledge.
- Institutes Infrastructure gaps

- Industry connect on regular basis – institute can take advantage of field experience from industry through projects, guest lectures and seminars.
- Curriculum upgrade – Slow/No revision and upgradation of books as per evolving techniques or technology.
- Skill requirements are challenging and are ever evolving. Today's skills become stale or outdated soon
- Faculty of collages lack industry experience which in turn results in poor quality of practical execution in institute.

CURRENT DEVELOPMENTS TO BRIDGE THE GAP

The approach for bridging gap of lacking Job readiness in IT sectors or other industries is by having partnership between industry and academia. Many companies are partnering with engineering collage and universities to align the education given at collages with the requirements of industries. Infosys has launched a program "Campus Connect", Wipro has also started a program called the Wipro Academy of Software Excellence, in association with BITS (Pilani). IITs are partnering with many industries to get practical knowledge for their students. Also IIT has started incubation programs which will help entrepreneurs or industries to do research work in the infrastructure provided by institute and support from experienced faculty. This will provide industry environment to students to learn with actual on job training. The other industries or institutes should work on these lines.

Client Domains of interactions with IITM at IIT Research Park

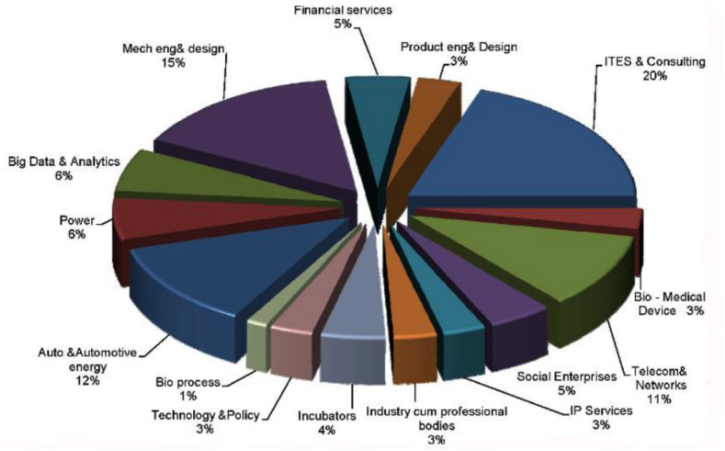

Fig. 2: References [1]

Role of Governments: Already an initiative taken by Government of India for skill development by forming a new ministry for the same.

EMPLOYABILITY IN IT SECTOR

The employability percent decreases with increase in the number of engineering colleges as per study done by AMCSAT, clearly establishing that opening more engineering colleges shall not solve the

problem of quality of engineering in country. What is required to focus is improve quality of education and collaboration with industries so that demand and supply gap is minimized.

Relation between the percent employability vs. the number of engineering colleges in each state.

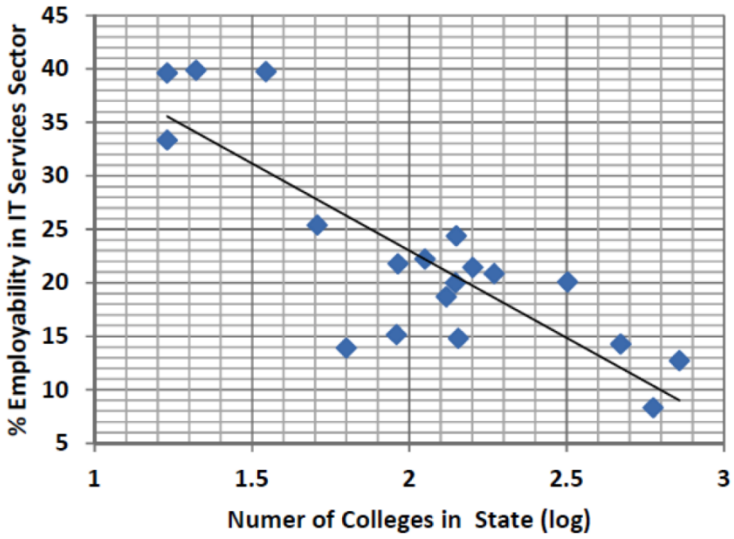

Fig. 3: References [6]

INSTITUTES' VIEW POINT

As per my current experience many industries are providing skill up training only after candidate join organization instead of supporting in project works or internships during the course of study. This further increases the cost to company as the skilling up is done after employment.

- Industry also has to contribute in bridging the gaps as ultimately they are the beneficiaries and the country as a whole. Industry should contribute to the following:
  - ***Frequent visiting faculty Support and interaction programs*** – Currently many institutes have visiting faculty program. It can be made effective by organizing working session with students, making these sessions interactive, and sharing of industry practices and problems.
  - ***Industries to facilitate internship programs*** or tie up with more and more institutes (Small size or private institutes) to increase industry connect with academia.
  - ***Giving Back to own Collage*** – There should be some way to give feedback from the recently passed out students either through social media or quick talk session with students sharing their personal experience in industry and problems faced by them.
  - ***Feedback system from Industry to Universities*** – Universities not getting feedback from industry for new joiners. There should be a mechanism to communicate feedback or gaps found in new joiners to the respective institutes. This will help institutes to improve.
  - ***Categorizing the student's aspirations*** – There should be a mechanism to identify the students' aspirations for future role. Like the students who wish to join industry is 1 category and the students aspiring to move to academics is 2nd category. According to their interest's practical/On-Job Training should be defined for them.

INDUSTRYS' VIEW POINT

Improvement Areas in Institutes

- ***Emphasis on soft skills*** – Students need to be inculcated with the skills like communication, passion to learn, commitment.
- ***Awareness towards Industry environment:*** Students should be well aware of industries work environment and the matrix used to measure employee performance.
- Like defense services trainings or ITI trainings are work oriented which results in better utilization of personal. Same pattern can be derived in educational institutes for practical's/laboratories.
- If we go by practices in medical collages they also have almost 1 year of internship and after 2nd year of collage actual hospital visit and learning practical applications. Same should be applied to industry.
- Infrastructure of workshops and Labs should be at par with the latest developments.

Curriculum

- Curriculum should be finalized in consultation with industries.
- Live case studies should be brought to institute to understand applicability better.
- Case studies should include Indian conditions or scenarios also and should be upgraded time to time. Visiting faculty can contribute to guide in working sessions.
- Practical and theory % distribution should be 50:50.

Faculty

- Teacher is an idol for students and every students expects answers or guidance from them. It is very important that teachers should have that practical/industry experience themselves to conduct the laboratory experiments.
- Faculty should have good interpersonal skill for better connect with the students.

New Technologies Skill Development

- Universities should start short duration programs on upcoming technologies. Like Big Database, Cloud computing, IOT etc. This will help students to upgrade themselves as per current demand.

RECOMMENDATIONS

Dedicated Quality Measurement Team

There should be mix of members with industry as well as academicians in the team for process improvement. It should be at individual university level.

- Evaluation matrix to be prepared for bridging the gaps and measuring the skills. It is important to define the goals and measure them accordingly. Industries also use similar mechanism to monitor their quality.

S. No	*Skills to be Measured*	*Tools for Measuring the Matrix*
1	Communication	Presentation, Debate or group discussion
2	Commitment, team Spirit, attitude	Team building activities
3	Reasoning skills	Subject specific execrcises/programs
4	Application skills	Practical exercises in Labs and workshops

- Maintenance of Database for passing % and employment stream wise effectively.
- Improvement plans should be derived from data analytics.
- As most of the organizations follow CMM Level 5 Model which is focusing on continuous improvement and institutionalizing of best practices, Universities should also work on those lines. Process improvement methods should be added like.
  - ***Causal analysis and Prevention*** – Like identify the problems happened in the past and how to improve them in future should be a continuous cycle at a defined frequency. Monitoring of trends and improvement to be part of it.
  - ***Innovations and improvements*** – A dedicated team who works with industry on upcoming or new areas and apply those learning in the practical or laboratories. Also these inputs can be shared at Council/Higher level for implementation across universities.

Industry and Academic Interface Improvement

- A dedicated team working with industry to improve on job training placements. Currently industries are reluctant to invest on students for on-job training/project work. There should be tie up of institute with companies for facilitating student's on-job training.
- Also they would be responsible for conducting seminar, visiting lecture interactive sessions from industry and dissemination of the outcome.

Infrastructure Improvement

- Sharing of workshops or laboratories among institutes: Different institutes working for their own gain. If institutes exchange their programs or sharing of facilities/Laboratories on payment basis this will reduce the cost and help in the improving knowledge base. For efficient implementation database of facilities should be available across institutes.

Motivating Teaching Job

In India teaching is considered to be the last resort by people whereas it should be of the top most priority. As teachers build the future of the country so they should highly motivated for doing this job.

Problems	*Improvement suggestion*
Faculty have theortical/academic orientation	Compulsory industrial trainings for faculty. Supporting staff at laboratories should be well trained and upgraded from time to time
Faculty selection should not be based on degrees only	• Recruitment process for faculty should add evaluation of practical Knowledge of a subject. • Passion for teaching, communication skills to be considered for selection. • Industry experience people should also be considered for faculty selection irrespective of prescribed qualification • Ratio of core to visiting/ industry faculty should be at least 50:50.
Equality in Remuneration for same qualification is not considered	Remuneration of teachers should be equivalent to any other job with same qualification to motivate and attract the talent.

Note: Refer to Section 7 and 8 for more recommendations.

CONCLUSION

Institutes and Industries are adopting new methods and strategies to improve employability and their smooth integration into the system. Strategies like focus on soft skills, practical trainings, improving faculty, collaboration with industry, workshops etc.

Efforts should be made to improve effectiveness of the strategies. Also It is been seen that by small contribution like Back To college, Crash courses for new technologies, Sharing of infrastructure, exchange programs, feedback system, Industry to be part of curriculum revision would help in bridging the gaps faster and effectively. Its high time now for us to revamp the Indian education system and joint initiatives by the industry and academia which will play an important part in plugging the talent gap in the years to come. Training individuals for the jobs of the future and allowing them to visualize what it possible today will not only make a difference in their lives but will enrich our communities now and for the future.

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A competent and experienced Senior Project Manager in HCL Technologies Ltd with 15+ years of experience having long track record of delivering the technology solutions as per customer expectation having good blend of technical and management skills. Ability to manage large teams in different domains. Extensive experience in embedded applications. Successfully managed both on-shore and off-shore operations with both in-house and remote teams. Successful in reorganizing, streamlining and strengthening existing operations, identifying inefficient processes and implementing reliable and cost-effective solutions to improve quality and ensure on-time delivery as well as enhance team efficiencies. Has the ability to build strong relationship with all stakeholders. Also part of Interview panel for campus Interviews in Institutes and skill up programs for fresher's. Experience in latest technologies IOT, Big Data Base and Cloud Platform. Have been part of Outstanding League at HCL.