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Guidelines for Improving Industry-Institute Research

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Abstract: Research plays a key role in improving the quality of education, which enables the student to improve innovative thinking and also to apply knowledge for a better society. The advantage for an institute in industry-institute collaboration is to provide placements and internships to the students which ultimately improve employability opportunities. An industry needs assistance of specialists for doing analysis of research problems. This resource is available in the engineering institutions. Hence a collaborative research benefits both industry and institute. This is cost effective solution for industry and a technology booster for institute. The highest level of industry institute collaboration is industry institute research. This can help the institute in building up their research profile and also for the industry to get research solutions to their problems, and gain access to intellectual property to convert them into business at large. This paper presents case studies of institutions that have established industry institution collaborations and research, and presents detailed guidelines for private self-financed affiliated colleges to develop industry institute collaborations and to establish industry institute research which could result in improvement of research activities of an institute resulting in improved quality of technical education.

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1.Introduction

Technical education forms the backbone for the development of any nation. Ideally, the journey between the industry and institute should be started with a simple interaction and gradually turn into a partnership between industry and institute complimenting each other's skills and expertise for mutual benefit. The technical manpower in India ranks as one of the largest in the world. But compared to its population, it is not significant. There is a great scope for improvement in this area. Bridging the gap between industry and institute is the need of the day which candecide the national development both economically and socially.

The goal of any technical institute is to produce skilled, globally competent professionals through quality technical education and to prepare them for immediate employment. Industries engross these knowledge professionals and enhance their production capabilities by contributing to the latest technologies.

Apart from this, industry research in institutions plays a major role in building opportunities to students for employment and in providing feasible solutions to

society and to engineering problems [3],[6],[8]. This leads to development of skill, knowledge and economy of the country. Increase in research leads to business development, job opportunities and also commercialization of research and development.

It is a proven fact that improvement in industry institute interaction can improve employability levels [1],[2].Faculty involvement in research and its affect on the attainment of graduate attributes was studied in [5].

Industry Institute interaction can be at different levels. The highest level of interaction that an institute can have with the industry is in providing research solutions to the industry problems. It is observed that the institutes that have successfully established ties with the industry and are involving themselves in industry oriented research have produced graduates that were sought after by the industry.Establishing industry institute ties and thus involving in industry research is not easy for institutes. Central and state funded universities and some autonomous institutes find it a little easier in developing relations with the industry and establishing industry institute research. Such institutes have established industry institute ties over years based on their infrastructure, faculty research capabilities, their affiliations and many other factors.

For a new or self-financed private institution, establishing industry institute ties is a daunting task. The scenario that is being considered is that of a self-financed private institute that is affiliated to a state university (affiliated colleges).

Industry research is an area most of the affiliated engineering colleges are not able to establish themselves in due to various factors.

This paper presents Industry Institute research in established institutions and proposes a step by step approach that can be followed by affiliated engineering colleges to improve industry oriented research in their institutes and thus contribute for the improvement of graduate employability levels.

Section 2 deals with the advantages of industry-institute collaboration. Section 3 deals with the present scenario of colleges and their placements. Section 4 deals with the study of established industry institute ties. Section 5 deals with case studies. Section 6 presents the approach to be followed for successful industry institute ties. Section 7 concludes the paper.

2. Advantages of Industry Institute Collaboration

There have been many works presenting the advantages of Industry Institute Collaborations [4],[5]. The advantages of such collaborations are two way – to the institute as well as to the industry.

- This is advantageous for institute faculty and students. Collaboration develops awareness among the students on job functions in the industries, provides proper technical and practical knowledge, skills and competencies to adapt to the industrial environment etc. Some of the advantages of industry institute collaboration for institutes can be listed as below:

- Lead to greater resources generation.

- More academic- industrial relevant curriculum.

- Better placements and internships to the students.

- The key benefit to the institutes is the impact on teaching and learning from industry based projects.

- Industry also benefits out of these collaborations. The programmes in the Institute focus towards helping and solving the scientific and technological challenges that industries care about. The advantages for the industry include the following:

- Can access the latest innovations, technological and management developments.

- Well trained technical personnel.

- Good business development for an industry by commercialization of research activities.

- Industry can look out for trained manpower for their specific requirements which can reduce their training costs.

3. Current Scenario

Currently in our country engineering education is being provided by different types of engineering institutes approved by AICTE for the year 2016-17[Source: AICTE Approvals for the year 2016-

17].The total intake in these institutes altogether is 3701674, out of which640573 students (which is about 17%)have been placed according to the AICTE database for the year 2016-17 (updated on 16th October 2017) (fig 2).

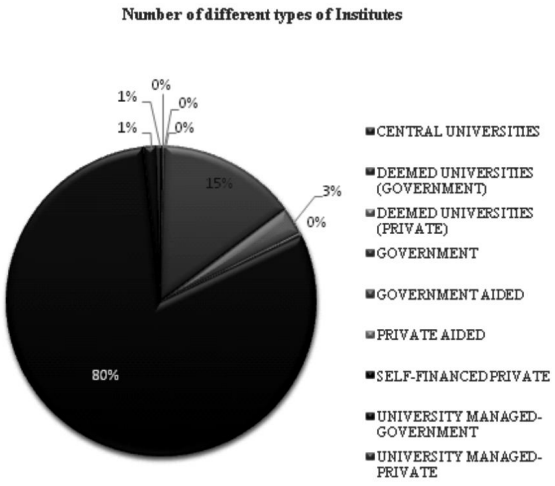

Fig. 1: Types of Institutions in India approved by AICTE for the academic year: 2016-2017 (Source: AICTE database)

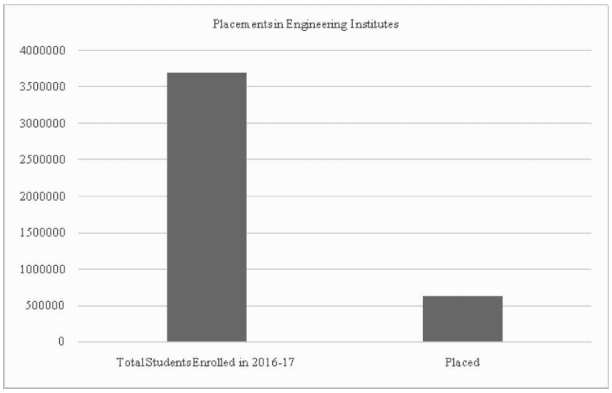

Fig. 2 Placements in Engineering Institutes (Source: AICTE database).

In the current scenario, the institutes that are being considered are the self-financed affiliated engineering colleges under state universities which are 80% of the total engineering and technology institutes.These are the institutes that produce the majority number of the engineering graduates in the entire nation. The focus should hence be the improvement of graduate employability levels in self-financed private / affiliated engineering colleges.

These institutions might be facing many constraints in their path to improve industry institute research. Some of these constraints include: non-availability of faculty with good research profiles, non-availability of the required resources for research, non-motivated faculty to perform research, and financial constraints.

This paper studies some of the institutes, their industry institute collaborations, and the parameters based on which these collaborations were established. Based on this analysis, certain guidelines are prescribed for the institutes to flourish in industry institute collaborations with the available limited resources.

4. Learning from others

There are three questions that need to be answered for establishing sustainable industry institute collaboration. The first question is that 'why did the industry partner with the institute'. The reasons for this may help us in improving the institute's preparation level.

The second question is 'what does it take to keep this phenomenon successful?'. Establishing industry relations is not enough but sustaining them is the requirement. The third question is 'what can other institutes learn from these institutes?'. Learning from experiences shall be very much helpful for other institutes.

4.1Reason for Industry partnering with the institute?

Industries partner with institutes to utilise the intellectual and strategic calibre of the faculty and students to contribute for a quality research program at competitive prices. Industry also considers the long-standing history of the institute and consistent contributions to technological innovations before its collaboration. The major factors which attract the industry might be high quality infrastructure, quality of skilled man power, openness to multi-disciplinary research, proximity of industrial hubs and its ability to provide expert technological research support.

When companies and institutions work in tandem they increase the level of knowledge and become powerful engine for innovation and economic growth.

4.2 Principles to keep the phenomenon successful

For a successful industry-institute research there should be well laid principles of collaborations,

resource sharing and commercialisation. This can be done by (a) Clear understanding, acceptance of distinctive roles and contributions. (b) Commitment to technological research support. (c) Periodic reviews through the meetings of the joint working group dedicated to the industry. (d) Keeping up to date with the emerging trends. (e) Well defined framework to ensure speedy initiation and implementation of the projects. (f) Access to top class infrastructural facilities and dedicated space on minimum monthly charges.

4.3 What can other institutes learn from these institutes?

The institutes can identify skill gaps in the market and potential for industry collaboration to ensure mutual benefitsin securing funds, knowledge share and hands on experience for solving real time challenges of the industry. Finally translating research into successful entrepreneurship.

4.4 Things to be learnt by the other institutes

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5. Case Studies of Industry Institute collaboration based on various parameters

Some of the national level institutions with established ties with the industry have been studied. The study revealed that all the institutes with good industry institute collaborations have some common parameters. We could list a few basic parametersfor the institutes that enabled and improved their industry institute collaborations: Infrastructure, Skilled manpower, Quality research at low cost, Multi disciplinary research, Consistent contributions to technological innovations, Proximity of industrial hubs, and long standing history of success.

The industries usually collaborate with the institutes based on these parameters. In the present study, the institutions are mapped to that particular parameter which the industry has selected for collaboration. The institutes chosen have been studied for these parameters that the industries look for in the institutes which is presented here inTable 1 [Ref 7].

For example, Most of the institutes are not mapped to the parameter - infrastructure. Which does not mean the institute does not have infrastructure, but shows that the industry has opted for other parameters in the collaboration process.

It has been observed that each institute is strong in some of these prerequisites mentioned but not all.

It is for this reason it can be deduced that any institute that can focus on these prerequisitescan establish industry institute relation in some way.

Table 1: Mapping of Institute requirements to set Industry-Institutecollaboration based on Case studies

Institute/ University	Infrastructure	Skilled Manpower	Quality Research at Low Cost	Multi disciplinary Research	Consistent Contributions to Technological Innovations	Proximity of Industrial Hubs	Long standing history of success
IIT Bombay			X	X	X	X	X
IIT Kanpur				X	X		
NIT Suratkal		X				X	
IIT Madras	X		X		X		X
IIT Delhi		X			X		
University of Hyderabad			X	X	X		

Considering our institution which is a self-financed affiliated engineering college, the establishment of an Industry Institute Coordination Cell, Research and Development Cell, conducting industry institute interactions, provision for research funding, infrastructure development, and improving faculty interest in research through a survey internally done[5], obtaining alumni and industry feedback (designed by the institute to extract the information required for establishing industry collaboration), all these efforts have improved the industry institute interaction in the form of industry visits, internships, faculty publications, faculty enrolment in research programs, and the number of projects being taken up on solving industry problems.

It can be inferred from Table 1 that institutions can build their relations with industries for industry institute research even if they do not comply with all the parameters listed in the beginning of this section.

Having studied the various parameters which affect the institutions for successful industry ties, it can be deduced that Institutions that are keen in

developing collaborations with the industry can follow certain processes and practices that would improve their industry institute ties.

6. Guidelines for institutes to enhance industry institute collaborations

This section presents step by step guidelines to be followed under various parameters to make an institute specially a private affiliated college attractive for industrial research. The institutes must focus on various aspects starting from funding to promoting the institute to the industry. Each of the parameter that needs institute focus are listed below along with the steps that need to be taken up under that.

A. IICC:

An Industry Institute Coordination Cell must be established in the institute to foster industry Institute relations. The Industry Institute coordinating cell (IICC) acts as a bridge between the institute and industry. The following functions must be performed by IICC

- The cell needs to collect input at the highest level from both the industry and the institute. Create a joint steering group including senior academics and company executives.
- Arrange industrial visits and industrial training for the faculty and students of the institution.
- Identify the industrial expectation and promote institutional preparation for meeting industrial needs by facilitating sponsored workshops, seminars.
- Should arrange Guest Lectures by Industry personnel.
- Should collect feedback from industry personnel when they visit the institute (Industry response survey form in Appendix 1).

B. Research and development cell:

Institutes must setup a Research and Development Cell. Research and development cell co-ordinates with research activities within the college and to take up joint research and development projects with institutes and the industries.

C. Funding:

Allocate separate budget for Industry Institute co-ordination cell which handles

- Joint Research & Development projects with the industries.
  - · Arrange industry visits and industrial training for the faculty and students of the institution.
  - · Provide technical consultancy and training to small scale and industries in close proximity.

D. Infrastructure:

- · Availability of better quality equipment (in the labs that are procured for their regular course work).
- · Phase wise improvement in infrastructure depending on the requirements for faculty (or) students for their research (or student projects).
- · Regular Maintenance of equipment.

E. Faculty Research:

- · Improve faculty interest in research by conducting Faculty development programs, faculty interactions with the industries and also through workshops.
- · Faculty and the respective departments should explore what research can be done with available equipment for the industry.
- · Mechanism should be laid in which faculty is exposed to regular research work through major projects, individual research interest and designing of content beyond syllabus (or) additional experiments.

F. Manpower:

- · Availability of industry experienced personnel in the departments wherever possible.
- · Lab technicians are to be properly trained and expertise to be developed among them.

G. Multi-Disciplinary approach:

Innovation depends on the strengths of institute and industry experts to work together across a number

of disciplines such as Engineering, Design, Testing, and Analysis. By encouraging multi-disciplinary academic programmes with industry it can help to break down the traditional methods and drive a new multi-disciplinary culture and curriculum.

H. Alumni:

Feedback from alumni (survey form in Appendix 2) must be obtained from the Alumni about

- What is their current work and problems faced if any in the technical domain
- Enquire if the institute can collaborate to that work in anyway.

I. Promoting the institute to the industry:

- Conduct research meets to showcase research talent and facilities available in the institute.
- Students project expositions to be held at least once in a year.
- Inviting industry personnel to deliver guest lectures in the institute.
- Publish research bulletin in the institute and distribute to the industry.

Taking the above parameters into consideration, and following the guidelines for each of those parameters, institutions that are moving towards improving their industry institute ties can succeed in achieving their objectives.

7. Conclusion and Remarks

This paper presents case studies of few national level institutes which have established themselves in industry institute collaboration and thus contributing to industry research. The scenario of self-financed affiliated engineering colleges under AICTE is considered. In orderto improve industry institute collaboration and hence industry research in these self-financed affiliated institutions, step by step guidelines have been proposed in this paper keeping in view the constraints faced by such institutions. These guidelines if followed can help in enhancing their industry institute research capabilities.

References:

[1] Anilkumar Nandi , Jyoti Bali , Kaushik M , Suhas Shirol"Industry-Institute Interaction : An Important Step Towards Empowering Skills of Engineering Students", in Journal of Engineering Education Transformations, Volume 29 , No.1, July 2015, ISSN 2349-2473, eISSN 2394-1707.

[2] A. Parameswaran, E.S.M.Suresh "An overview of industry–institute collaboration on the quality of education in engineering institutions" 41st ISTE annual national conventiononrole and relevance of regulatory bodies in higher education, December 2011.

[3] A. Ramesh Pai, Prithi jeevan, A.P.Achar "Role of industry institute interaction in making of entrepreneurs",International Journal of Current Research and Modern Education (IJCRME), ISSN (Online): 2455-5428, 1(1), 357-361, 2016

[4] B.M.B.Patil "Industry-Institute Interaction" International Journal of Latest Trends in Engineering and Technology (IJLTET)Vol. 3 Issue 4 March 2014

[5] Divya Nalla,Sneha Nalla, "Research Culture in Engineering Faculty: Its effect on attainment of graduate attributes", presented in 46th IEEE sponsored International Conference Frontiers in Education - FIE 2016, held from 12-15th October 2016, at Erie, PA, USA.

[6] K . J a y a p r a k a s h , A . R . M e e n a k s h i "Academicresearch freedom in industry-Institute partnership"Youth Education and Research Trust (YERT)J.Acad. Indus. Res. Vol. 1(12) May 2013.

[7] "Select Case studies of academia-industry collaboration".MHRD-AICTE-CII International Workshop on Industry-AcademiaCollaboration, New Delhi, April 14-15, 2013

[8] Padma M.C,Sridhar V, "Role of Industry-Institute Interaction to Promote Education and Entrepreneurship". In Proceedings of the International Conference on Transformations in Engineering Education. Springer, New Delhi, 2015.

Appendix 1

INDUSTRY RESPONSE FORM

NAME: _____

ORGANISATION DETAILS: _ _____

PHONE/MOBILE: _____ _____

E-MAILID: _____ _____

1. What do you think are the strengths of the college?

2. What do you think are the areas of improvement in the college?

3. Please identify which among the following are the likely avenues for the colleges to collaborate with you/yourorganisation. Please mention t he corresponding point of contact (name and email/phone number) for pursuing the matter.

Mode of collaboration	Details	Interested? Yes/No
Project funding opportunities	Research projects	
	Prototyping	
	Development Project	
	Any other	
PhD (for faculty)	Supervision/ Co-supervision	
	Areas of interest	
	Access to library/other resources in your organisation	
	Identifying open research problems	
M.Tech projects(for maximum 10 students)	Supervision/ Co-supervision	
	Areas of interest	
	Access to library/other resources in your organisation	
Consultancy	Areas of interest	
Industry visits	For undergraduate students	
	For post graduate students	
	For faculty	
Guest lectures	For students	
	For faculty	
Sponsored Labs/Softwares	To develop skill man power that would be useful for your organization	
Value added courses	To develop skill man power that would be useful for your organization	
Departmental Advisory board member	Being the academic advisor for the department	
	Meeting/Communicating with the department once in a semester for advise	
Placements campus/ off campus interviews for freshers	B-Tech	
	M-Tech	
	MBA	
	MCA	

4. What in your opinion must be done to increase student employability?

5. Point of contact:

   Signature

Appendix 2

ALUMNI RESPONSE FORM

NAME: _____

BRANCH: _____

YEAR OF PASSING: _____

CONTACT NUMBER: _____

E- MAIL: _____

ORGANISATION DETAILS: _____

Role in the organisation:

Present area of work/research:

In what discipline our institute can collaborate with your organisation?

Does your organisation have any problem that we could work on?

Any other suggestions on additional courses / skills to offer present students: