

# Institution-Industry-Society–Bringing Together

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**Abstract:** Engineering and Technology played a key role in the growth and development and enhancing the quality of life of the people through improved goods and services. Ever since the Industrial Revolution, investments in this segment have proved to be reliable engines of economic growth all over the world. It can also be observed that the countries which adopted a cohesive approach and spent more liberally on Research & Development (R&D) have achieved better dividends. The approach invariably included Institute-Industry Collaboration (IIC) as one of the key ingredients. India's contribution in R&D stands at 0.8% of its GDP as compared to other Asian Countries like China, South Korea, Israel and Japan with 2.7%, 4.3%, 4.3% and 3.58% respectively (1)

This paper highlights the need for a reformatory approach in R&D in general and strengthening of the Industry-Institution-Society alliance in particular in the context of continued social challenges being faced in ensuring healthy food, safe drinking water, housing, Electricity, Transportation, Sanitation, health care, free education and clean environment to the masses at large. It is brought out that there is a dire need to have a prudent, affordable, sustainable and decentralized Institute-Industry Collaboration (IIC) rather than confined or semi-centralized R&D for the developing countries like India to achieve meaningful results through smaller but relatively voluminous and successful R&D interventions which can be termed as De-centralized and Expansively Enterprising Partnerships (DEEP) amongst Institute-Industry-Social Groups. The need of scientific gap analysis between the expectations of the stakeholders, Intra disciplinary coordination and Institute to Institute (I2I) alliances are emphasized with due recommendations to rejuvenate the present scenario. At the end, the Institute-Industry collaboration activities undertaken and being planned by Nalla Malla Reddy Engineering College (NMREC) are put forth besides concluding remarks and action points.

**Key words and Acronyms:** Industry- Institute Interaction (I2I), Industry institute collaboration (IIC), Research and Development (R&D), Gross domestic product (GDP), knowledge sharing, innovation, National Association of Software and Services Companies (NASSCOM), Indigenization, Make-in-India, Memorandum of Understanding (MOU), adoptability ratio, All India Council of Technical Education (AICTE), University Grants Commission (UGC), Ministry of Micro, Small and Medium Enterprises (MSME), Centre for Monitoring & control of IIC activities (CMC-IIC), Small Scale Enterprise Resource Planning Solutions (SS-ERP)

## I. INTRODUCTION AND BACKGROUND

Industries and institutes have been collaborating for over a century, but the rise of a global knowledge and economic

liberalization further intensified the need of more and more strategic partnerships to accelerate research projects relevant to societal needs. Massachusetts Institute of Technology (MIT) of U.S.A has been in the lead with numerous MOUs on IIC resulting in achieving more sponsorships, internships, employment opportunities to the Students and recognition to the Institutions including patents. (2,9)

Way back in 1961, the Government of India had also created a strong platform of Industry- institution collaboration through National Apprenticeship Scheme with the objective of bridging any gap, in so far as practical or hands on experience of fresh Graduate Engineers, Diploma holders and Vocational pass-outs and also to enhance their technical skills for making their suitability in job absorption as per the needs of the Industry. According to 2011 report of NASSCOM, the employability of Indian Engineering Students was only about 25%. (5)

India has gained significantly through Industry-Institute collaborations as IT Industries like IBM, Oracle, Wipro, TCS etc. have worked hand in hand with premier Institutes. According to NASSCOM, the sector has increased its contribution to India's GDP from 1.2% in 1998 to 7.5% in 2012 with an increase of exports and domestic revenue by 9% (6).

Pratham Satellite conceptualized by IT, Bombay launched in Sept 2016 in collaboration with ISRO (7). The potential for IIC continued to be high in Mechanization in Agriculture sector, productivity improvements in Agro based industries, technology associated with white revolution (Dairy industry) and MSME sector. Though considerable outcomes and results were achieved through IIC in IT, Communications, sanitation and e-governance further improvements are needed in delivery of goods and services when it comes to improve the conditions in rural areas and ensure upbringing of smart villages.

The paper also expresses concern that although the Industries and the Institutes have something in common when it comes to meeting the social goals, they continue to practice stand alone or predominantly independent research for new inventions and discoveries either to introduce new products or services or to improve the same. In this context, it is worth mentioning that according to data from global market research firm Euromonitor, India has the biggest advantage of youth force the median age of its population as a whole is 28, significantly lower than that of regional

peers China and Japan, at 37.6 and 44.4 respectively (8)

Therefore, the skill levels of the Indian youth can be qualitatively harnessed through a suitable strategies to strengthen the Industry –Institution-Society collaborations and Partnerships that include sponsorships from the local chapters of Chambers of commerce, national and state chapters of Productivity councils and Confederation of Indian Industry etc.

## II. THE NEED OF IIC FOR SOCIAL TRANSFORMATION

The primary needs such as clean drinking water, food and housing, Electricity and Energy storage Sanitation, education and healthcare of the present day Societies continued to be inadequately addressed particularly in the third world countries.

Privatization of Engineering Education has undoubtedly contributed in large pool of available manpower and yet there exists a large vacuum that in terms of availability of skilled manpower for the Industries within the country and outside, and such gap in the skill sets can be properly identified through Industry-Institute-Society Interactions and concerted efforts on set righting the same.

There is an ample scope and potential to bring improvements in the said segments by certain policy change initiatives of the Governments that make IICs to flourish and help in developing new approaches for solving problems. The academicians can lend theoretical inputs, conceptualization and generalization skills and industry can bring in practical reality in which the conceptualization can then be rooted. (12)

Indigenization in Indian Context under “Make in India Campaign” demands series of gross root level collaborations with a campaign mode of R&D approach that can be referred as De-centralized and Expansively Enterprising Partnerships (DEEP) amongst Institute-Industry -Social groups. According to NASSCOM and McKinsey report " Perspective 2020: Transform business, Transform India", the industry in India could face an employee shortage of up to 3.5 million. Employability of graduates in India continued to be very low. (E.g. 10-15% of graduates for business services, 26% engineers for technology services. (12)

A well-structured IIC is also necessary for analysis and initiating any revisions in the academic curriculum to enhance the employability, placements and quicker adoptability of students to working environment of the Industries.

The needs of the society is also dynamic necessitating gap analysis to be organized at least once in five years by the Planning commission just as Electric Power Survey (EPS) conducts Supply–Demand gap to chalk out comprehensive power planning. Such analysis and the decisions emerged on

transforming and strengthening of IIC related activities would help in evolving path breaking technics and cost effective and time saving solutions to accelerate housing for the homeless and electrification of the so far un- electrified houses etc.

## III. IMPEDIMENTS IN IIC AND I2I INTERACTIONS

Following are the key impediments in nurturing a sustainable IIC.

- Loss of focus due to pre occupation: The Institutes are busy with implementing their academic Curriculum whereas the Industries are ever engaged in meeting day to day production targets and market demands, even quite often ignoring the productivity improvement issues in the process.
- With regard to relationship building, at times, who approaches first becomes an issue and lack of pro-activeness impairs conceptualizing and commencement of the project. ie either the Industry approaches the Institute or University with an idea which they think can be executed by the Institute or in collaboration or the Institute that comes up with an idea and a Project Concept Note (PCN) to seek cooperation and work together proposal with the related Industry.
- Inadequate continuity of interactions during the life time of the project once the collaborative project is conceived and commenced.
- Lack of transparency and completeness in the gap analysis between the industry and academia in terms of understanding the requirements, laboratory and proto typing facilities at first and the follow up action to eliminate the voids such as lack of clarity on mutual expectations and translating the ideas to actions.
- Inadequacies in the existing Government policies, financial incentives, robustness in structural framework to stimulate and encourage collaborative R&D, Teaching and Consultancy programs.
- Thrust given to research and development at local/regional level through active involvement of research institutions, universities, industries and non-governmental organizations.
- Lack of Intra disciplinary coordination (D2D) within the Institute and Intra institutional (I2I) coordination for the projects requiring cross functional support.

## IV. MUTUAL BENEFITS

The key benefits that may be exclusive or mutual for the respective stake holders of the Institute- Industry –Society work together partnerships shall include the following.

### Institutes:

- \*Knowledge sharing and practical insights on Field-related /Shop floor issues and work together opportunities.
- \*Enhanced placements to students.
- \*Insights on improvements needed in Curriculum.
- \*Collaborative research and consultancy projects.
- \*Industry sponsored laboratories.
- \*Gain access to technical facilities in the Industries for R&D
- \*Learning Opportunities through Industry sponsored student fellowships and internships.
- \* Opportunities to Faculty experts as members or Honorary Directors in Industries.

### Industries

- \*Gain strong and Multi-disciplinary conceptual background and refresher programs to Industrial workforce.
- \* Knowledge sharing and problem solving solutions on productivity improvements.
- \*Minimal Induction training and quick adoption of youth for production jobs.
- \*Access of Lab / equipment testing facilities.
- \* Smart solutions on efficient load management, Energy audit& conservation, big data analysis, mini automation & ERP solutions etc.
- \* Quicker value additions in key areas – Farm machinery, Bio-Medical Engineering, Nano Technology, Renewable Energy and Energy Storage.
- \* Opportunities to experts from Industries to work for Institutions as Faculty members.

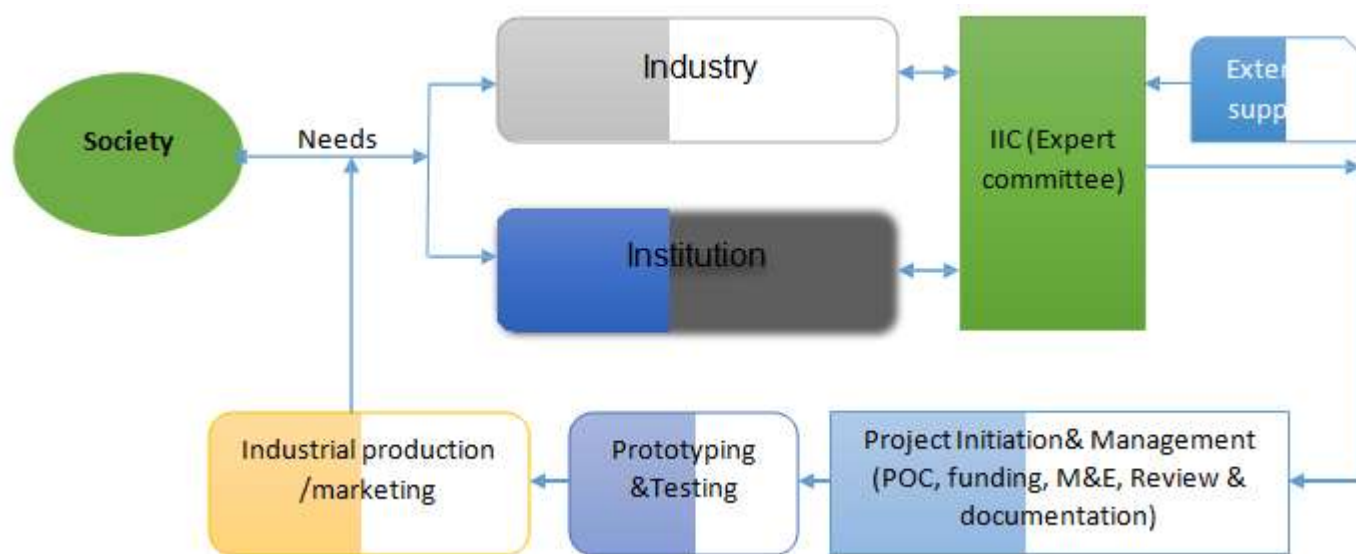
The benefits were also described in the earlier writings (3,4,10) .It is quiet expected that effective IIC will fetch win-win outcomes ,if not the immediate results to all stake holders and in the process the Society at large.

### V. RECOMMENDATIONS ON POSSIBLE AREAS OF COLLABORATION

The possible areas with indicative action points for an

effective IIC are as follows.

The R&D based Institution-Industry alliances which are more confined to premier institutes and industries should be expanded with a concept of de centralized and distributed Research which can be termed as De-centralized and Expansively Enterprising Partnerships (DEEP) amongst Institute-Industry-Social Groups as follows.



The above schematic is intended to represent on how the Society al needs are identified and relevant inputs are

transmitted for IIC. The Expert committee under IIC shall include the experts from the Industry and the Institute. It shall incorporate intra- disciplinary (D2D) and Intra-Institutional (I2I) excerpts as per the requirements of the project identified.

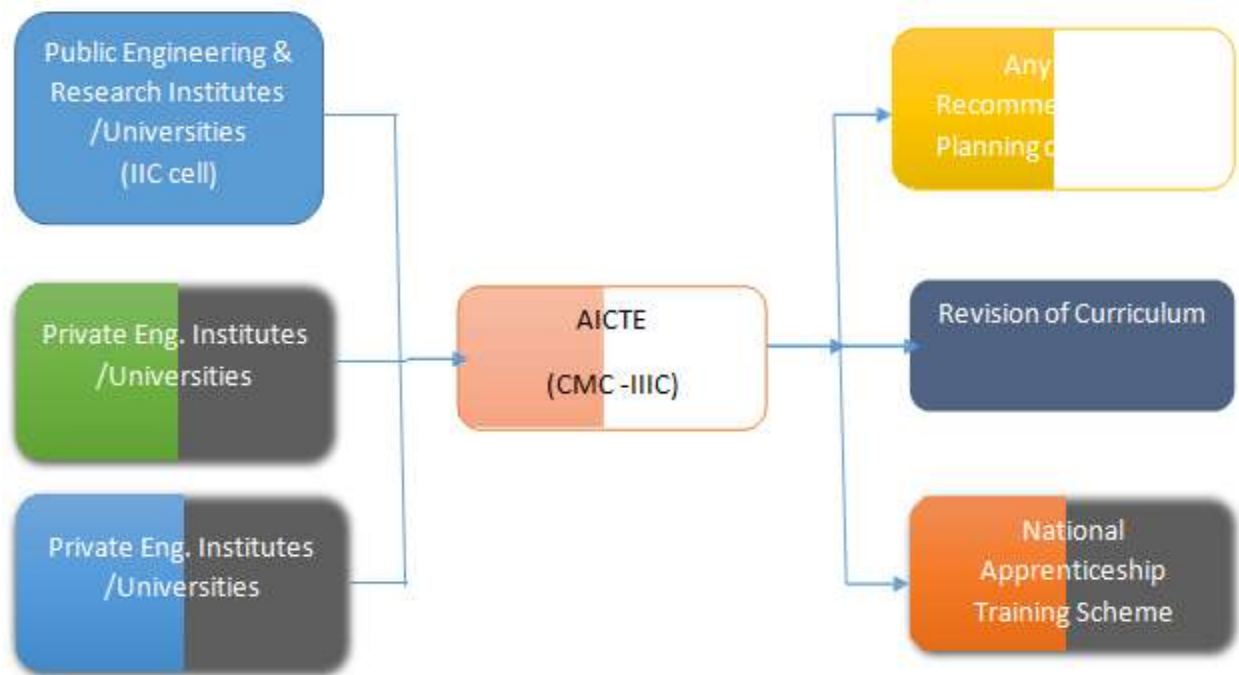
For instance, an Institutional Team which likes to develop a cost effective alternative for Dissolved Gas Analysis (DGA) equipment may require help from a chemical Engineering Dept. but if it is not existing in the Institute, collaborate with another Institute may be preferred under I2I collaboration.

The project cycle involves continuous information exchange among the Stakeholders and feedback mechanism right from the identification, conceptualization, development, testing and to the final stage of commercialization of the product or delivery of services. The external support envisaged comprises sponsorship not only from Industries, University, AICTE or UGC but it could be from local self-help groups, public representatives like MLAs or MPs from their funds and so on.

Industry-Institute-Collaboration (IIC) may be introduced as one of the electives in the academic curriculum at UG /PG level duly incorporating and updating the best practices, breakthroughs and success stories across the globe.

Training to enhance domain knowledge that includes Faculty conducting concept oriented refresher program, Management Development Programs (MDPs) and on Quality Management System (QMS) for the fresher as well as other employees on soft skills. This will help association of institute with industry and which could lead to many other forms of partnership at a later stage.

IIC Preferences and Governmental support on R&D shall not be confined or merely prioritized to certain premier public Institutes like IITs ,NITs and IIMs and major research centers and Laboratories under the Government but shall be expandable to other Institutes like any AICTE approved Private Engineering Colleges, Poly technics, Industrial Training Institutes in the model proposed as follows.



While IIC centers are mandatory in all Public and Private Eng.& Technical Institutions , AICTE shall have an overall monitoring and regulating cell to encourage all institutions under its umbrella in an equitable manner . It is envisaged that the National Apprenticeship Training Scheme shall also enforce mandatory Internships similar to implementation of Apprenticeship as per the act 1961 through more encouraging policy interventions.

The Institutes shall also explore Tie ups with outside Institutions offering industry linked job oriented Courses and imparting the same in the College campuses at affordable fee on bulk negotiations .This approach will enhance the confidence levels and the employability of the students. For

instance, when the conceptually sound students are equipped with certain design software tools, their employability in the Industries is bound to be improved significantly.

When it comes to mutual engagement of experts for knowledge sharing and initiating projects under IIC, it is not only the Institutes who should engage Industry experts as faculty members, the Industries should also engage the Institutional experts /professors in the position of Honorary directors, so as to identify and bridge the gaps to have a perfect synergy in Industry- institute collaborations on R&D.

National Institute of Personnel Management (NIPM) and Confederation on Indian Industries (CII) etc. should take the initiative to organize meets between the Industries, Chamber



of Commerce and the Institutions as frequent as possible

Institutions can undertake certain specific tasks to develop technology solutions for effective Monitoring & Evaluation of important initiatives such as Swatch Bharat Mission etc. which may contribute for exposure employment generation.

Ministry of Micro, Small and Medium Enterprises (MSME) should encourage Institutions to study and undertake small scale cost effective automation cost effective solutions for SMES.(11)

The Institutions with their multi-disciplinary, conceptual strong hold, can undertake Indigenization of imported spares in the industries to save foreign exchange.

The Institutes may offer consultancy services in developing standard operating procedures, outage analysis and downtime reduction measures and small scale Enterprise resource planning (SS-ERP) solutions and recommend energy audit and energy conservation measures.

Institutes can extend contributions to Industries in certain crucial areas such as condition monitoring, failure analysis, reliability engineering, nondestructive testing, big data analysis, Artificial intelligence, Robotics and Productivity improvements.

Institutes can offer their Laboratory infrastructure and related facilities to industries. For instance, Power Utility can approach the Local Engineering Institute to assist them in load flow studies of their Network expansion project to evolve Pros and cons with suitable recommendations on possible improvements with Cost Benefit Analysis.

#### VI. IIC ACTIVITIES IN MNREC

**Nalla Malla Reddy Engineering College was established in the year 2001 by Nalla Malla Reddy Educational Society** in the best of environs with a magnificent structure and created the best of infrastructure to provide quality technical education blended with Industry oriented practical knowledge making it a **‘Complete Institution** to produce professionally competent quality engineers with high ethical standards. The College conducts B.Tech, M.Tech and MBA programs and is affiliated to Jawaharlal Nehru Technological University. The College is well equipped Department specific labs as follows.

- Computer Science and Engineering Labs
- Electronics and Communication Engineering Labs
- Electrical and Electronics Engineering Labs
- Information Technology Labs
- Mechanical Engineering Labs including CAD-CAM Lab

Common facilities for all the students include a Computer Center, Digital Library with 30 systems, Engineering Workshop, IT Workshop, Drawing Halls, Language Lab,

Physics and Chemistry Labs and Quality Assurance (QA) Cell. The College has a Research Center and Industry-Institute Interaction Training centers for EEE, Mech, ECE and CSE Departments.

The Industry Institute Research Meet (IIRM) is held annually wherein the Institute may project its capabilities in terms of availability of expertise and facilities and ascertain the needs of the industry.

Students' projects are exhibited as part of the meet which are very much appreciated by the delegates. Students of this College have also participated in seminars conducted by Premier Institutes and Universities and submitted the papers. One of the Uniqueness of the College is improving the **Language skills** of all faculty members and the students with 100% cursive writing as an approach of uniformity.

NMREC has Industry experts as Emeritus professors in the Engineering Braches in order to inculcate industry orientation in teaching and elevate the knowledge levels of the students best suited for industries as they pass out from the Institute.

As a result, the college also has the best track record of student placements and further embarking on Institute-industry-Society Collaborations /partnerships in a big way.

#### VIII. CONCLUSION

There is no amplification in stating that the Countries which had strong roots of IIC flourished R&D had industrialization at a faster rate than the countries which did not had or have the same.

Certain structural changes and revamping measures indicated in expansion and decentralization of the R&D sphere and through proactive forms of partnerships among Industry -Institution-Society, would go a long way in improving the mutual responsiveness and perfect Synergy to achieve the expected breakthroughs. Knowing each other's expectations and limitations helped in strengthening the areas of common interest and to move new discoveries from lab to the marketplace and to the society in the past and will happen so even faster in the near future once the stakeholders start working together in true spirit. The work together scheme shall also include involving the student community in Socio-engineering activities in a significant way so as to achieve the common and bigger goal of Nation Building.

Further, there is a dire need of Intra disciplinary coordination within the Institution and also between Institution to Institution (I2I) to be an integral part of the overall IIC .Then only the gap existing between industries to Institution can be minimized for achieving quick adaptation, employability and productivity related objectives aimed at engineering an egalitarian Society.

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