

# Internationalisation of Indian Technical Education Empowering India with Respect to International Collaboration

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**Abstract:** *One of the prominent Indian systems which have an active participation in developing, revamping and augmenting the education is Technical Education system being governed as All India Council for Technical Education (AICTE). This governing body has an extensive purpose in marinating young minds as scientists, researchers, engineers, technologists, entrepreneurs, etc. In this paper, we have discussed about international collaboration as one of the technical education component to empower the Indian education system for the progress of students as bright gems worldwide. International collaboration can be comprised of Research, Innovation, Skill Development, Industry Collaboration, Entrepreneurship and gaining New Knowledge. Research associates R&D cell, Centre of research training cell, Internships in MIT, IIT and summer research fellowship programme. Innovation involves innovation centre, copyright and patent guidance cell, project proposals grants cell. Skill development involves placement cell training, SDP cell, FDP cell, Industrial training cell. Industry collaboration being engaged in working with abroad universities, faculty exchange and conduction of joint seminars, and workshops, Infosys campus connect programme, Wipro PRP training programme, IBM organizing ICAT, CSI contest programme, CISCO and Juniper Networking centre. Entrepreneurship involves extramural lectures and workshops on business management, self employability organization, coaching courses on entrepreneurial, entrepreneur professional tools academy, collaboration with corporate entrepreneurs. To gain new knowledge, we can propose technology academy such as IOT cell, Mobile Application cell and Web services cell.*

**Keywords:** Research, Innovation, Skill Development, Industry Collaboration, Entrepreneurship, IOT cell, Mobile Application cell, Web services cell

## 1. Introduction

AICTE [1] (All India council for Technical Education) was established in 1945 which is acting as a governing body and comes under the department of higher education and ministry of Human Resource development to provide the appropriate education system. It helps to achieve the objective in developing the management education system and the technical education system in India [1].

### 1.1 Origin and functioning

In November 1945, AICTE was established as national level Apex Advisory Body for auditing the efficiency about the technical education and to [1] contribute the country development in an integrated and coordinated manner. To plan, formulate and maintain the standards along with norms, and also to achieve the quality assertion through funding in priority areas, accreditation, evaluation, monitoring, maintaining the certification of the party, awards, integrated development, ensuring coordinating and managing technical education in the country [1].

### 1.2 Schemes Provided by AICTE

For technical Education, AICTE [1] [2] provides the following schemes Research and training in architecture,

Town planning, Engineering, Technology, Management, Pharmacy, Hotel Management, Catering Technology, Applied Arts and Crafts in different phases.

### 1.3 ISTE (Indian Society for technical Education)

Technical education system [2][4] which provides personality improvement to the students and the teacher's career is being developed to empower the education system by Indian Society for technical Education (ISTE). ISTE is one of the dominant national professional non-profit making societies in technical education system.

The discussion of the paper is as follows. Section I provides a brief description about AICTE, ISTE. Section II describes the importance of technical education. Section III describes about research ideology. Section IV describes about innovation. Section V deals with skill development, Section VI describes about industry collaboration. Section VII describes about entrepreneurship, Section VIII describes about gaining new knowledge. Section IX concludes the paper.

## 2. Importance of Technical Education

Normally, education can be classified into three levels,

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- **Social Education:** It is based on educating the social responsibilities.
- **Spiritual Education:** It is based on evolving the personality of a man inside himself.
- **Vocational Education:** It concentrates on professionalism of a person. It explains about Engineering, Medicine, Trade, Commerce and Agriculture field.

With the help of all kinds of industries, this technical education accomplishes the technicians. A high knowledge is required for high skill development which is used for improving the technology. To develop those high skills, it needs more amount of investment and time, so to fulfil the studies of technology, to encourage the government, to support financially and make international level, the institution is needed. The own state itself will have to provide the knowledge to the students at international level, which helps them to do something for their nation.

To improve the [4] technical education in India, the government of India has introduced many schemes, they are as follows,

- National Scheme of Apprenticeship training [3]
- Support for Distance Education and Web Based Learning (NPTEL) [3]
- Indian National Digital Library in Engineering, Science and Technology (INDEST-AICTE) consortium [3]
- National Programme of Earthquake Engineering Education (NPEEE) [3]
- Technology Development Mission [3]
- Direct Admission of students abroad [3]
- Establishment of centres of Excellence in frontier areas of science and technology [3]

### 2.1 National Scheme of Apprenticeship training

[3] As per the guidelines and policies laid down by the Central Apprenticeship Council (CAC), it gives the practical training to the diploma holders, Engineers and vocational passed outs of around 10,000 industrial organization/establishment. This scheme is implemented through four regional Boards of Apprenticeship/Practical (BOAT's/BOPT) at Kolkata, Kanpur, Chennai and Mumbai, which was fully funded by the Ministry of Human Resource Development (MHRD) autonomous organizations.

This scheme main goal is to match the gap and enhance their technical skill for diploma holders, fresh graduate engineers and vocational pass outs for suitable in need for industry as per the job absorption.

### 2.2 Support for distance education and web based learning

[3] In 2003, the MHRD begin the new project which is "National Programme for technology Enhanced Learning (NPTEL)", (which contains curriculum based video courses) to strengthen the learning in technical education with the help of technology, that will improve the education of engineering in nation.

In this NPTEL [3], the five major engineering branches like, Mechanical engineering, Electrical, Electronics and communication, Civil, Computer Science is included under graduate curriculum courses. It also covers the basic courses which is mandatory for the engineering students. The AICTE model curriculum affiliated by the major universities like Jawaharlal Nehru Technological University, Vishveshwariah Technical University, and Anna University are helpful to design the content of the course.

### 2.3 Indian National Digital Library in Engineering, Science & Technology (INDESTAICTE) Consortium.

[3] Ministry of Human Resource Development (MHRD) introduced the "Indian National Digital Library in Engineering Sciences and technology (INDEST-AICTE) consortium". It is based on the centrally funded institutions which are used to access the databases and electronic resources. This resource is available for open ended proposition in which all education institution will make use of it.

### 2.4 National Programme on Earthquake Engineering Education (NPEEE)

[3] The National Programme on earthquake Engineering Education (NPEEE) was launched by MHRD due to earthquake and Orissa cyclone in January 2001 and 2000 respectively, with the help of seven IISC and IIT Bangalore as resource institute. Its main goal is to,

- Develop suitable curriculum
- To train teachers of polytechnics, Engineering colleges and Schools of Architecture.

Under the centrally funded programme, the engineering college teachers may be trained through this NPEEE either as long-term or short term training. It includes as follows,

- Development of resource textbooks/materials, etc.
- Faculty development through short-term crash programme and long-term programme.
- Faculty exchanges between lead institutions and other institutions in the country, and the academia-industry exchanges.
- Development of library resources in technical institutions.

### 2.5 Technology Development Mission

[3] In all IIT and IISC started this Technology Development Mission (TDM), in which the main objective is to develop the technology towards the direct participation and involvement of the industry. Many academic and industry are collaborated to develop the mission projects. The main goal of this scheme is to assist the industry for developing the latest technology and industry-institute interaction.

### 2.6 Direct Admission of Students Abroad

[3] This scheme is helpful for the students who needed global technical education becoming the high quality technical education provided at the Indian Institutions.

### 3. International Collaboration on Research

In Europe, Research and development (R & D) is represented as Research and Technical (or technological) development (RTD) which is connected with the governmental innovation or corporate. This is one of the components of the innovation, which is situated at the front end of the innovation life cycle. In INDIA, around 162 colleges have research and development cell. In TamilNadu, 70 colleges with one or two departments have research and development cell.

#### 3.1 R&D Cell

[17] The members included in this research and development cell are,

- Chairperson
- Dean
- Convener and
- The members from the concerned department.

Meeting will be held frequently based on conditions. It promotes and manages the externally funded development and research projects, Institute-Industry interactions as well as patents.

#### 3.2 Centre of Research Training Cell

[17] Collect an idea which is best in the particular research area (which one is interested) as domain. As a principal Investigator (PI) trainer should take their professional interest in identifying the new and important research questions [6]. Then they should conduct the brainstorming with the help of a group to help in terms of idea mapping. Then they should organize the internal review panel as a team to talk over the efficiency of the proposed project [6].

#### 3.3 Internship in MIT, IIT

It just created in 1861 by the Massachusetts state Legislature; it just makes a foundation of entrepreneurship and innovation. MIT ranks first in Industry-financed R&D compared among all the universities according to National Science Foundation. Currently 700 over companies are working with students on projects and faculty of mutual interest. The following are the corporate sponsors such as Samsung, Raytheon, Quanta Computer, Novartis, Lockheed Martin, Intel, Ford Motor, Google, Dupont, Eni, Boeing, BP, BAE, TOTAL, Siemens, Shell, Sanofi etc. One of the partnering at MIT [6] is the global industry leaders who use the innovation and technological advantage as key drivers to their competitive advantage. They engage completely in MIT's interdisciplinary culture, collaborative and they mainly focus on wringing practical applications from excellent ideas. One of the Company DuPont which was established in 2000 i.e. DuPont MIT Alliance (DMA) brings each institution's strength together in biological, chemical sciences and to develop new materials for biosensors, bioelectronics, biometric materials, new high-value materials and alternative energy sources. They also define new policy and new business for these emerging technologies.

### 3.4 Summer Research Fellowship Programme

During the academic year, the Summer Undergraduate Research Fellowship (SURF) is conducted to absorb the research activity of students [7]. The faculty members of a college will give the proper guidance of this competing undergraduate programme. Under this SURF [7] banner, some of the colleges provide the students for one or two semester senior research project. The following are the procedure for SURF,

- Application
- Submission
- Selection Process
- If selected attend the class
- Can be on any department.

Once the students selected for this programme, they can be placed with the scientists in centre or else anywhere in India, for 2 months continuously with the stipend of Rs.6k per month. The candidates can be selected based on the following manner,

- The student should have good academic record.
- The recipients of NTS merit scholarships, but they should not receive any fellowship from other source to be eligible.
- Habit of reading books and paper, i.e. demonstration of special preparedness and special aptitude.

### 4. International Collaboration on Innovation

#### 4.1 Innovation Centre

Innovation center is a local government organization, industry organization, universities, hardware or software vendors in which they are partnered with the institutions with some common goal to service the local software economies support [8]. Each center will tune its current program to the local needs and they give same services and contents which is designed to progress faster technology and encourage local software economies through skill and industry partnership, professional training and innovation [8].

The primary area being focused is industry partnership. Successful partnership will be established by linking organizations and people in the innovation [8] ecosystem. The ICs do this by offering programs on partnering with the organization, regional and local industry association. Improvement of software quality assurance programs and software industry clusters involves skills and intellectual capital. It [8] mainly concentrates on people enablement and intellectual capital with software, business management and marketing courses, software development courses, and employment programs for students [8].

The Innovation [8] Accelerator focuses on enhancing local capacity for innovation through hands on engagements. This includes labs for start ups, entrepreneurs, students, and partners.

#### 4.2 Copyright and Patent guidance Cell

Cell should help [9] the innovators to focus more on the following innovations,

- Agriculture
- Robotics
- Artificial Intelligence
- Automotive Industry
- Web services
- Department of Biotechnology (DBT)
- Department of Atomic Energy

Copyright [9] and Patent guidance Cell should work in collaborating with authorized bodies as follows,

- R & D cell
- Council of Scientific and Industrial Research (CSIR)
- Defense Research and Development Organization (DRDO).
- Indian Council of Agricultural Research (ICAR), etc.

#### 4.3 Project Proposal Grants Cell

[10] It is a type of business proposal which delineates the objection of a proposed endeavor together with the steps necessary to accomplish the objective. It just contains the milestones at which certain aspects of the project are to be completed. It also contains a detailed budget that includes a summation of anticipated costs and a time frame for specific expenditure. [10] Writing successful grant applications is a long process which begins with an idea. Also the cell should have collaboration in receiving funds for projects from bodies such as UGC, DST, TNSCST, AICTE, SERB, etc. for implementing the projects. Eligible Criteria is as follows,

- Local and Global/Regional Projects.
- Duration of projects and Amounts awarded.
- Eligible Beneficiaries.
- Assistance to Applicants and Transparency.

Outline [10] of On-line Project Proposal System (OPPS) allows prospective grantees to submit their project proposals to UNDEF electronically. This scheme has “Biotech-based Programmes for societal Upliftment”, which is being implemented throughout the country to benefit SC, ST, women and rural people. In this scheme, demonstrating and training programmes are being conducted in various income and employment generating activities.

[10] Impacting Research Innovation and Technology (IMPRINT – INDIA), a flagship national initiative of the MHRD, launched by the President, Prime Minister and Human Resource Minister on November 5, 2014 at the Durbar Hall, Rashtrapati Bhavan is aimed at addressing and providing solutions to the most relevant engineering challenges faced by the nation by translating knowledge into viable technology (products or processes) in selected technology domains to enable, empower and embolden the nation for inclusive growth and self-reliance. Cell should provide the following guidelines [10],

- The implementing agency must be an experienced, qualified and reliable organization, preferably a non-governmental organization (NGO) registered under the

Societies Registration Act, or a religious institution. The organization must be registered under the Foreign Contribution Regulation Act (FCRA).

- Project proposals have to be accompanied by at least 3 competitive quotations/ cost estimates (in Rupees) for each item to be purchased /constructed from the grant.
- Incomplete applications (i.e. lacking detailed description of the project, lacking compulsory quotations etc.) cannot be taken into account.
- The project has to be completed within six months after approval and before the end of November 2016.
- The implementing agency does also have to contribute financially to the project and has to be in a position to finance all upcoming follow-up/ running costs for a period of at least 2 future years.
- Overhead costs (personnel, administrative, travel and other running costs) of the implementing agency or the project itself cannot be supported.
- Under German law it is not possible to finance a project which is already co-sponsored by any other organization, which already receives contributions from the German Federal Budget (e.g. European Union, United Nations etc.).

In order to be considered for possible funding in 2016, project proposals need to be submitted to the German Consulate in Chennai in original by March 15<sup>th</sup>, 2016. Application needs to be signed by two authorized persons.

## 5. International Collaboration on Skill Development

### 5.1 Placement Cell Training

Campus interview or campus placement is the program which is conducted among the educational institutes or in a common place to give a job to students who are pursuing or in the stage of completing the programme. Depending on their ability of the students work, capability, focus and aim, the students has been selected. Within the group of the colleges, the job placement program is conducted. The following are some of the training program being conducted by placement cell which is divided into 3 categories,

- **Technical** - To improve the technical proficiency in the technical subjects related to their profession.
- **Aptitude and Reasoning** – It is the part of the recruitment process which students to face written exams for most of the companies.
- **Soft Skills** - It is mainly to enhance their employability and enable to blend into the corporate/industrial culture after joining into a company.
- **General** - involves group Discussion and Personal Interview Training, Personality Development Programs, Team Building, Team Communication, Team Behaviour, Developing Lateral Thinking, Attire Management, Etiquette Building – Social & Business, Conducting Mock interviews.



### 5.2 Student Development Programme Cell (SDP cell)

This cell has to organized and developed by their respective departments to develop the student to get through in campus. It involves the following training,

- Project Placement - Companies recruit students to do their academic project in the interiors industrial environment.
- Student Internship Placement - Companies recruit the students as interns
- SDP (Service Delivery Platform) [11] - It is a set of companies which provides a service delivery architecture for a type of service delivered to consumer, whether it will be a customer or other system. Mainly it will be used in the context of telecommunications, which can be applied to any system that will provide the service. It often requires integration of IT capabilities and the creation of services which cross technology and network boundaries. They also provide environment for service creation, service control and orchestration and also execution.

[11] SDP (Service Delivery Platform) involves Service Creation Environment (SCE). It is used by the developer to create software, scripts and resources representing the service to be exposed. The [11] main purpose of the SCE is to facilitate the rapid creation of new communication services. The leveraging of converged Java EE and SIP service creation environments has accelerated the adoption of specific Service Delivery Platform solutions. Java-based applications developers, traditionally focused on IT applications, are now rapidly developing real-time communications applications using Java EE and network connecting protocols like SIP and Parlay X web services. Normally the software vendors are combining these technologies to reach out to a broader developer base.

### 5.3 Faculty Development Programme Cell (FDP cell)

[12] It is a professional staff development cell. This professional development will include teacher training and it is for before beginning teaching. Normally the professional and faculty development refer to on-going professional learning for education. Additionally the educators may pursue self-directed learning professional development, although the team faculty development is less commonly applied to this scope of activity. Procedures to Implement are as follows [12],

- Teaching circles - High-Impact Faculty Development, Low cost.
- A Focus on teaching and learning at Mid-Career
- Technology Enhanced Faculty Learning Communities.
- Teaching that benefits beginners and those who mentor them.
- Simple Commitment but Long-term challenge.

Faculty should focus on following,

- Distance Learning
- Instructional Design
- Faculty Development
- Classroom Management
- Education Assessment
- Faculty Evaluation

- Learning Communities
- Trends in Higher Education
- Curriculum Development

### 5.4 Industrial Training Cell

This cell helps to launch some of industry oriented laboratories to train students on the scope of learning new technologies using the company tools and resource materials. It is closely related to industry collaboration. This also works with respect to FDP cell. It allows the FDP cell faculty members to get trained by the companies being certified and then training the students. Some of the company which provides such training is Wipro where they train on core Java and Infosys campus connect where they train on core java and agile software product development.

## 6. International Collaboration on Industry Collaboration

Corporations collaborating with universities to provide educational opportunities to students who fit the talent needs of the companies. One of the education projects in Hong Kong which has been to be a success is the industry academy research model, in which corporations support selected graduates for talent reserve purposes.

### 6.1 Abroad Universities

[13] Abroad studies are helpful to get a high-quality education and also to experience the immersion in a new culture gaining the global mind set and improving the future employment prospects. Admissions test results (e.g. GMAT/GRE results, for graduate programs). Indeed, the 2015 Open [13] Doors report from the Institute of International Education found that India is the 12<sup>th</sup> most popular country for US students abroad. The following are the Benefits of Abroad Universities,

- Experience a different culture,
- Make new friends,
- Develop your language skills,
- Grow in self-confidence,
- Gain a new academic perspective,
- Establish international contacts
- Enhance your employability
- Wealth of personal and professional benefits.

### 6.2 Faculty Exchange

An effective mechanism to address this problem and should give a unique opportunity to the universities aspiring to rejuvenate and upgrade faculty resources in their science and engineering related departments. It invites the visiting professors for full time and executive education on the course need in particular domains. The visiting adjunct professor or professor engagement offers opportunity of interaction of Indian professor with exploring teaching and foreign professors, and other academic engagements. India has explored visiting professors in areas of strategic management, Finance, Cross culture Management, Insurance

Business, International Business, Sustainable development, Retail Management.

It allows conducting joint seminars, and workshops, Infosys campus connect programme, Wipro PRP training programme, IBM organizing ICAT, CSI contest programme, CISCO and Juniper Networking centre. ICAT is an International Centre for Automotive Technology (ICAT) which is a leading media college with the 3 state-of-art campuses across south India. It is prestigious collaborations with the reputed international universities and reputed Indian, curriculum of International standards, finest pedagogy and infrastructure and 100 % placement are few features which make ICAT the first choice for aspiring minds. It is the best college for professional education in design and media which campuses at internationally acclaimed degrees, prime locations and diverse courses and extensive alumni network.

## 7. International Collaboration on Industry Entrepreneurship

A person who manages and organizes any enterprise, specifically a business with acceptable risk and initiative is said to be entrepreneur. The entrepreneur can get benefit from the continued education.

The skills needed for the entrepreneur is Resiliency, Focus, Invest for the long-term, Find and manage people, Sell, Learn, self-reflection, Self-reliance.

### 7.1 Extramural Lectures and Workshops on Business Management

Business management is the process which is used for developing the plans, procedures, strategies and policies which will guide the business on both long-term and day-to-day basis manner. It includes material resources, human and financial to achieve the organizational objectives [15].

[15] Business Process Management is a business based solution approach which capable to view a business as a collection of process or workflows. This is software which enables a business to model, then implement, execute, monitor and also optimize their processes [15].

In India, Centre for [15] Executive education (CEE) at the ISB conducts the programme which is mainly for working professionals that are designed to give timely based learning interventions which makes them to up skill and progress in their careers. These programmes are available among the multiple business area, which is for different seniority levels in different international and national location. The following are the business management covering area [15],

- Analytical Skills
- Communication Skills
- Business Enhancement Skills
- Business Writing
- Customer Service
- Finance and Accounting
- Information Technology Management
- Business Analysis and Quality

- Human Resource Management
- Sales
- Strategic Alliance Management
- Strategic Planning
- Thinking and Innovation
- Time Management. Etc.

### 7.2 Self-employability organization, coaching courses on entrepreneurial, entrepreneur professional tools academy, collaboration with corporate entrepreneurs

Self-employability makes the entrepreneur to start their own business [14]. Enrolling in an online coaching course always helps out to handle multiple roles within the company and also improves to get knowledge. There are also many coaching classes which help to get the following [14],

- Provides the talents necessary for the entrepreneurial success and the importance of entrepreneurship.
- It helps to improve their business success by apply their entrepreneurial talents.
- Arrange small groups by discover, direct and develop their entrepreneurial talents.
- Also support the development of entrepreneurship in the community.

[5] Entrepreneur professional tools can be Buffer, Asana, Google Drive, SoundGecko, AngelList, Fiverr, Elance, Wix, ShareDesk or DeskTime, Google Now, TripIt Pro, NerdWallet, Audible/Kindle Unlimited, Meetup, Pinterest, LinkedIn, Contently, Talkwalker, etc.

Collaboration with corporate entrepreneur creates more job opportunities for entrepreneurs in the business world. It allows working with others to excel as business leaders achieving long term process. This will help the entrepreneurs to start up a business. It involves group marketing, investment and funding. It increases innovative ideas and new technologies from entrepreneurial businesses to stimulate growth. Corporation engages with small ventures to perform research or studies. It encourages investing in small ventures to finance innovative projects.

## 8. International Collaboration on Gaining New Knowledge

To gain new knowledge, technology academy has organized some of cells such as IoT [16] cell, Mobile Application cell and Web services cell. IoT [16] cell involves in implementing real time application projects using IoT platforms so that they can gain new knowledge of learning. Mobile application cell involves developing and designing mobile phone apps using appropriate IDE such as Eclipse where the cell has to organize workshops and hands on to develop the apps. Web services cell involves in designing web based applications using advanced java programming skill.

## 9. Conclusion

We conclude that to empower the technical education in India International collaboration plays a dominant role in the development of student education system. We have discussed some of the collaborations on Research, Innovation, Skill Development, Industry Collaboration, Entrepreneurship and gaining New Knowledge. They are many more different collaboration of technical education related to global empowerment of human resource where detailed study of those schemes can be discussed in future.

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