Industry-Academia Interaction in India: The Current Scenario and the Future

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Abstract

Education plays an important role in the holistic development of an individual. Better quality of life, more job opportunities, higher earning potential and growth of the economy are all linked to a good quality of education. Education is a very effective tool in creating skilled manpower. The employment ability of a student improves drastically when given exposure to trends in the industry and also when a student gets the chance to interact and collaborate with industry experts. Such an interaction prepares the student to face real world problems. World over, it has been observed by experts in the industry and scholars in academic circles that there is a gap between what the industry needs and what is taught in the universities. It is imperative that the current education system is scrutinized for further improvisation. As far as India is concerned, the National Education Policy (NEP) 2020 provides a framework for a plethora of reforms, some of which are linked to better employability. The policy provides for relevant changes in the education system which is conducive to encouraging Industry-Academy collaboration. The present study first gives a comprehensive overview of Industry-Academia collaboration in the context of India. Past endeavours in the pursuit of this collaboration - both on part of the public and private sectors, are discussed extensively in the study. How NEP is providing a channel to bridge the gap between academia and industry is also deliberated upon.

Keywords: Critical Thinking, Education, Employment, Industry-Academia Collaboration, National Education Policy

1. Introduction

Education is one of the most valuable assets one could have today and even more valuable is the kind of education that makes a person ready for life outside the universities. Quality education has become synonymous with a comfortable future. Education is not only important for the future of few individuals, rather it is seen as an investment for the advancement of a nation. It is a powerful tool for economic, political and social change and hence has a central role to play in the development of any country[1].

Education is the primary source through which one could enlighten themselves about the intricacies of the world around them and also equip themselves with the knowledge through which they could be a valuable asset to society. It is right to say that the aim of education should not only be imparting knowledge but also generating new knowledge. Knowledge generation is a long-term process which requires a combination of targeted policies, academic will, continuous improvements in developing the suitable pedagogy and a strong determination to contribute to the advancement of the nation.

The changing needs of expanding industry, trade and commerce and technological advancements warrant changes in the education system from time to time. Educationists across the world have called for radically amending and improving education models. One critic

among many, Ken Robinson has argued that education systems across the world today were modelled to suit the needs of the Industrial Revolution and thus there is more emphasis on STEM majors - Science, Technology, Engineering and Mathematics[2]. Policy changes in education, pedagogy and curriculum should give equal emphasis to all fields and pave way for greater flexibility in education. Today, India is witnessing an unprecedented shift in industrial, social and business environment which in turn is leading to a change in occupational patterns and hence the skill set requirements of individuals. The higher education system needs to recognize these changing patterns and accordingly address the issue of generation of relevant work force which is ready for competing in the global market. As far as India is concerned, the National Education Policy (NEP) 2020 provides a framework for a plethora of reforms right from primary education to higher education. These reforms are set to produce self-dependent citizens who can meet the demands of the changing world. NEP gives a great amount of flexibility to its students and empowers them with skill sets required to enter the job market. NEP 2020 focuses on greater Industry-Academia collaborations. It has the provision for appointing industry-experts as teachers and also compulsory internships in industrial fields.

The National Education Policy has been a central tenet to government's policy initiatives in the sector of education. The first National Education Policy came out in 1968 under Indira Gandhi, the second in 1986 under Rajiv Gandhi and the third in 2020 under Narendra Modi. Each education policy has addressed the needs of the time in which they were released. The first education policy in 1968 aimed at national unity and hence it promulgated the use of Hindi in education. The policy called for an increase in expenditure on education and 6% of the national income was allocated to implement various educational reforms[3].

The 1986 National Education Policy focused on making education opportunities available to girl child, minorities, Scheduled Castes and the Scheduled Tribes. The concept of remote education and correspondence learning were also addressed in the policy, paving way for the Indira Gandhi National Open University (IGNOU)[4].

The National Education Policy of 2020 is different from its predecessors in multiple ways. NEP 2020 aims to make education more holistic with greater scope of critical thinking. Use of technology in education has also been emphasized. Greater autonomy to educational institutes and Industry-Academia collaborations are also proposed in the new policy.

The National Education Policy also proposes introducing a stage-wise mechanism, wherein colleges would be granted autonomy over a certain period of time and would develop into autonomous colleges that grant degrees in their own names. These autonomous colleges will have liberty to modify their syllabus in consultation with the industry. They can have experts from industry on their advisory board. NEP also suggests that these autonomous colleges can evolve into research-intensive or teaching-intensive centres. Some level of autonomy to educational institutes will help them become specialized centres in particular areas of research and cater to local industry's demands. Other than institutional autonomy, the NEP also speaks of pedagogical autonomy where teachers can to some extent design their own syllabi and each college can set their own curriculum. This step will encourage holistic learning, inter-disciplinary and encourage debate and discussion in higher centres of learning.

The government is working with set deadlines to implement the various features suggested in NEP. The recommended Four-Year Undergraduate Programme (FYUP) shall be introduced in several universities including the University of Delhi in the academic session 2022-23. In the aforementioned Four-Year Undergraduate Programme, the students can avail the option of multiple entry and exit options. Herein, if the student exits after one year of study, she/he will get a certificate, a diploma if only two years of study are undertaken. A degree shall be awarded at the completion of the third year and an honours degree in the fourth year wherein the student shall be expected to write a research dissertation[5].

The National Education Policy has received praises from various sections of the academia. In a paper published by UN University's World Institute for Development Economics and Research, Kumar and Varghese argue that NEP could improve the quality of education in India. They compare India's call for reforms-to-reforms China introduced in 1961 which radically changed the education system in China. To quote Kumar and Varghese[6], "NEP 2020 has components that have the potential to improve quality, equity and efficiency of the education system".

The current trend of online course and Industry-Academia collaboration seeks to enhance one's 'employment quotient' by equipping them with a new

skill set which increases their chances of gaining suitable employment opportunity and fill in the gap between what employers' demand and applicants offer. The Industry-Academia collaboration, though still in its infancy has boosted the practical learning and this has led to a paradigm shift from the routine rote-learning to a new world of experience-based learning. The facilitation and training provided by the industry combined with theoretical knowledge given by the colleges and universities provides students with the best combination of the 'actual' and 'real-world' knowledge which increases their employability exponentially. In this paper we would like to review some of the existing Industry-Academia interactions. We would like to highlight some initiatives which have been taken in this direction by the government and how companies are reaching out to universities. In the end we have reviewed how NEP is all set to bring relevant changes which can give impetus to the Industry-Academia interactions. Such endeavours would generate skilled manpower who will be a valuable asset to the society.

2. Review of Literature

India has had a significant growth in the service sector since the liberalization after the 1991 reforms under the P.V. Narasimha Rao Government. Successive governments did not alter the liberal economic policies thereby ensuring continuity in growth. India since then has become a hub of Business Process Outsourcing (BPO)[7]. Multinational Corporations have invested heavily in India and hired Indian personnel especially engineers who were skilled as well as available for substantially lower wages than their counterparts in the West.

After the 1991 economic liberalization, several companies flocked to India to recruit young engineering graduates. However, compared to counterparts in the West, their education was inadequate for industry demands; hence, the need arose to train them after recruiting them. This is often called 'on-the-job' training[8]. It is also a widely acknowledged fact that the quality of different Higher Education Institutes in India varies greatly and hence the knowledge imparted is disparate and not uniform. In what are seen as 'talent management' measures, multinational companies often send their Indian recruits to enrol in part-time Master's courses, certificate and refresher courses and MBA programmes[9].

On-the-job training is capital and time intensive and it is important to train students before they enter the job market. The companies have to spend a substantial amount of capital and time to train new recruits which hinders research and development. So, it's better to have specific training while studying and hence collaboration is a must. The need of the hour is for greater interaction, cooperation and collaboration between Universities and the Industry to facilitate better education for students and greater employability. Industry-Academia collaborations help upgrade the curricula of the partner-university and also help to upgrade the institution's laboratories. The company collaborating with the university in turn gets the opportunity to invest in the future of prospective hires and gets access to the infrastructure of an established institution[8].

It is apparent that despite significant growth in different aspects of education, there are many lapses. Prasad and Bhat[10] highlight that in India quality research occurs only in pockets such as the Indian Institute of Science (IIS) or the Indian Institute of Technology (IIT). They also highlight statistics of serious concern such as the number of researchers which is as low as 216 researchers per million populations and that postgraduate enrolment is 0.5% of the total student enrolment. Prasad and Bhat have also highlighted some systemic problems such as the fact that a research-oriented mindset is not developed in Undergraduate students. More emphasis is given on teaching rather than research. Prevalence of rote learning undermines critical thinking faculties in Indian students. The academic institutions need to generate trained manpower that can analyse the real-world problems and be an asset to their employer.

3. Industry-Academia Collaboration in India

The Industry-Academia collaboration between Indian universities and numerous multinational companies/industries has been on the rise in the recent past. Generally, the trend has been such that industries get into agreements with universities where they fund research and development in certain specific technologies and areas of interest which would eventually bring commercial benefit to them. It is usually a time-bound and purposive programme for achieving certain specific goals and not a means for conducting long-term academic inquiry.

It provides the universities with valuable funding for generating practicable knowledge and providing the students with industry specific and market demanded research experience. In return, the industries reap the benefits of the results and products of the collaboration under the oversight of experienced faculty and domain experts[11]. It further creates a set of ready to hire candidates with skills and experience needed by the industries. Institutes of Eminence (IOEs) and major public and private universities are entering into such collaborations with varying industries in the fields of information technology, bio-technology, automobile development, finance, etc.

It is important to note that Industry-Academia collaborations can become successful when the environment is conducive and lucrative for both an educational institute as well as the industry. There is an investment of time, money, manpower and other resources. Active governmental intervention can facilitate greater interaction between the two sectors. The Government of India has been very supportive of and keen to increase the funding for research at academic and research institutions in the country. There are several pre-existing successful models of Industry-Academia interactions in India. In the following sections, we shall look at initiatives undertaken both by the public as well as the private sector.

4. Initiatives by the Public Sector

In the past decade the Government of India has taken numerous initiatives to set up research parks/incubation centres across the subcontinent. The centres are spaces where stakeholders from academia and industry come together and focus on research and innovation with economic utility and sometimes its social impact in focus. The industries enter into collaboration with the academia and researchers/students to generate creative outcomes from already existing or new research which is of commercial significance. Most often university research parks are located close to or inside university campuses. Both centre and state government give financial grants for setting up such centres. These parks/centres have attracted several industries to set up their research centres and invest in machinery and equipment for research purposes. It creates a localized hub of creative ideas, competitive and innovative researchers, entrepreneurship and industries that are willing to invest in research.

In India, the Indian Institute of Technology – Madras was the first to set up a research park in the year 2009-10 with an aim to emulate the success of research parks of the western universities in the Indian context[12]. To its credit, the IIT Madras Research Park (IITMRP) has been a huge success as it has incubated more than 200 start-ups and houses the research and development units of over 70 companies[13]. IITMRP has become a prominent location for regional economic development fuelled by technology. Not only is it coming up with technology-based solutions to commercial and social problems, but it is also bringing in valuable foreign direct investment. IITMRP has a unique system which ensures that industries regularly interact with the university in their research pursuits. The companies earn credits for supporting R and D projects, offering internships to students, sponsoring students' research, consultancy to university faculty among many other activities[14]. Owing to the success of IITMRP, the Ministry of Education, Government of India in March 2018 approved the setting up of research parks at 9 IITs[15]. To facilitate an effective interface with industry, IIT-Delhi established a foundation for Innovation and Technology Transfer (FITT) way back in 1992 (Gandhi, 2014). Through this venture a number of innovations in science and technology have been commercialized. More recently it has set up an Innovation Technology Transfer Office (i-TTO) to support and promote the technology transfer ecosystem in India. The i-TTO will educate the stakeholders in intellectual property rights and the legal aspects of technology transfer[16].

Biotechnology parks have been set up to transfer the technologies developed in the domain of biology, from laboratory to field. Such parks have been developed in different states across India; namely in Andhra Pradesh, Karnataka, Kerala, Uttar Pradesh, Assam, Punjab and Tamil Nadu. The Golden Jubilee Biotech Park for Women, Siruseri, Chennai stands out as it is for women entrepreneurs and nearly 50% of the staff employed comprises women[17].

In 2016, Atal Innovation Mission (AIM) was set up under NITI Aayog to promote the culture of innovation and entrepreneurship in India. A core objective of AIM is to establish new incubation centres called "Atal Incubation Centres" (AICs) and support some pre-existing "Established Incubation centres" (EICs) which can together serve as catalysts for promotion of tech-driven innovative start-ups and self-employment activities while they are in their initial stages. This flagship program

has been brought in to revolutionize the entrepreneurial ecosystem in the country[18].

Another initiative by the Central Government was the establishment of the Biotechnology Industrial Research Assistance Council (BIRAC). This was established in 2012 as a public sector organization which aims at providing an enabling environment for holistic biotechnology innovation. It functions as an Industry-Academia interface and engages in a number of impact driven initiatives such as targeted funding, technology transfer and intellectual property management to help the biotechnology firms stand at par with the global standards. The Contract Research Scheme (CRS) under BIRAC explores the possibility of transfer of lab scale technology developed by academia to a commercial level - research initiative. Under this scheme, the Public Sector Research Institutes and Private Universities who have the 'pre-existing scientifically established proof or leads can go in for further validation of the pilot studies by company partners. It is supposed to be completed within a defined time frame and the IP rights remain solely with the academic partners. This initiative provides financial and technological support and also ensures protection of IP rights. The results of innovation thus reach the destined levels in a time bound fashion[18].

Bio-NEST (Bioincubators Nurturing Entrepreneurship for Scaling Technologies) is a scheme under BIRAC which provides support to establish bio-incubators either as standalone entities or as a part of the academic institutions[19]. Through these, 59 incubators have been established and supported by BIRAC throughout the country including institutions like Ahmedabad University, Banaras Hindu University, BITS Pilani, AIIMS Delhi, Mizoram University Aizawl and many more. This initiative will help the academic researchers to conduct their research work smoothly in close interaction and facilitate technology exchange with the industry or start-ups.

Additionally, the Office of the Principal Scientific Advisor, Government of India launched 'Manthan' on 15th August 2022 to increase engagement between researchers and industry. The project will help to facilitate innovation, research and development, discussions on emerging challenges in technology and inventions having social impact. This would be based on its three pillars namely - information exchange, exhibitions and events. The platform can be used in a demand-supply model where the demand side (industry, organizations, governments, embassies, etc) can post their problem statements and opportunities and the supply side (academic/research institutes, students, start-ups, etc.) can offer their solutions[20].

As far as policy making at the state level is concerned, Bengaluru in Karnataka is one of the fastest-growing tech-hubs in the world. There are many multinational technology companies, think tanks and R andD centres in the city. The government of Karnataka, to promote this growth launched the 'Engineering Research and Development (ER and D) Policy' in March 2021 which offers several subsidies to companies that wish to establish R and D centre(s) in the city or expand existing centres. Subsidies include reimbursement of up to 50% rent up to 2 crore rupees and recruitment assistance of up to 20 lakh rupees. The state government promises further subsidies if the organization provides employment to more than 3,000 people or has an investment of Rupees 250 Crores or more[21].

5. Initiatives by the Private Sector

Private intervention is necessary to provide an impetus to innovation. Since the liberalization of 1991, several companies have taken initiatives to collaborate with academia. This is a mutually beneficial exercise for both the parties.

One of the earliest examples of Industry-Academia collaboration is NASSCOM which is an acronym for National Association of Software and Service Companies. It is a non-government association, established in 1998 to provide adequate skills to the IT workforce in India to compete in the global market to keep pace with the advancements that are taking place in the fields of artificial intelligence, machine learning, cyber security, etc. The NASSCOM Centre of Excellence was set up in July 2016[22].

It has centres in Bengaluru, Gurugram, Gandhinagar and Vishakhapatnam, which collaborate in areas like; health care, agriculture, manufacturing, digital transformation to name a few. Further, NASSCOM collaborates with universities in specific areas by designing courseware with the aim of enhancing employability of students. Chamakura Malla Reddy (CMR) University, Bangalore has a course in global business foundation skills which was developed by active participation of NASSCOM. A course in cyber security launched by IIIT Sri City has been developed with support from NASSCOM.

The Electronics System Design and Manufacturing Sector (ESDM) in India is growing at a fast pace. The digital revolution happening worldwide and in India is going to generate jobs in this area. The India Electronics and semiconductor Association (IESA), a non-government association, has signed a MoU with IIT Kharagpur to pursue advanced research in this field[11].

The tech conglomerate, Microsoft in 2014 launched the Microsoft Academy Accelerator wherein Microsoft has partnered with 10 colleges. In the collaboration, the curricula at undergraduate level were scrutinized and amended by taking suggestions from experts in the field to accommodate current industry and business needs as well as space for future innovations. Microsoft experts also conduct seminars on business scenarios and also hold technical sessions on cloud computing, machine learning, future research etc[23]. This collaboration gives students exposure to Microsoft's infrastructure, platforms, access to experts and their technical know-how. In 2019, Microsoft further announced that it would establish Artificial Intelligence labs in partnership with institutes such as BITS Pilani, BML Munjal University, KL University among others[24].

On similar lines, Amazon web service educate (AWS-educate) provides online training to students, specifically in the area of cloud computing. On similar lines IBM has also made some of its products, including big insights big data tool, IBM Cognos descriptive analysis tools and IBM Watson cognitive analytics tool available to students of select institutes. To provide technical skills to students VMWARE, a virtualization software business company has developed software which helps in reducing IT complexity and streamlining processes. The software can be used by Institutes to train their students, thereby improving the employability of students.

E-commerce giant Flipkart is also focussing on having collaborations with a number of institutions in India in the areas of Artificial Intelligence, machine learning etc. Flipkart signed MOUs with IIT Patna under which both the entities decided to collaborate in before-mentioned fields and lead some joint research activities and internship opportunities. Flipkart is also working with some other reputable institutes like IIT Kharagpur, IIT Bombay, IIT Kanpur, IIM Ahmedabad and IIM Kolkata in its business-related areas. It has recently signed a MoU with Foundation for Innovation and Technology Transfer (FIIT) which is an industry interface organization of

IIT Delhi to carry out research in social commerce and related areas[25].

An Indian multinational automotive manufacturing company, Mahindra and Mahindra has also been actively emerging as a major collaborating partner and has recently signed MoU with select Indian universities to impart skills related to IT Infrastructure Management Services (IMS). It has identified 5 universities with the aim to provide them with the required technological and knowledge related support[26].

6. Some Examples of Successful Academia – Industry Collaborations

The collaboration between PES University and Intel India is a befitting example which is based on an Industry-Academia approach that focuses on a student learning-centred approach. The Centre for Innovation and Entrepreneurship, PES and Intel Technology has had a very successful partnership with mutually rewarding benefits for each party. During the two-year MOU signed by both of them, the students were taught a new course on Practical Approaches to Deep Learning (PADL) and they participated in a Research and Innovation Contest (RIC). The course on PADL was designed by the faculty at PES with inputs from engineers from Intel and was taught using real life examples[27]. The RIC promoted scientific thinking among students and a trend towards paper publication was evident. A mutually rewarding outcome saw the light of another MOU. Such examples can be followed by other collaborators as well.

Chandigarh Group of Colleges, Landran has built an excellent academia interface. They have collaborations with a number of universities, to name a few: Oracle, Dell Services, Newgen Software Ltd., Capgenium Pvt. Ltd. The students are encouraged to take industry projects and are involved in case studies get opportunities to work as trainees and participate regularly in seminars and conferences. Further companies like WIPRO, Cognizant, Infosys provide certified student programs at the university campus. Such courses enable students with better job competencies and smooth placements[28].

Some other prominent examples of the Industry-Academia collaboration include Kalinga Institute of Industrial Technology (KIIT) signing MoU with nearly 15 companies like Wipro Technologies, Infosys, Siemens

India, Oracle India, IBM, Microsoft, SAP Labs, Tata Steel and many more. The institute aims to provide students with the best possible skill-oriented education in collaboration with these corporate houses. On similar lines, Pimpri Chinchwad College of Engineering, Pune; SJB Institute of Technology, Bangalore, Sri Sri University, Bhubaneswar, Mepco Schlenk Engineering College, Villupuram have signed MoUs with a number of industries thereby providing excellent job opportunities to the students.

Here it can be observed that IITs and other engineering colleges are leading the space. The collaborations predominantly take place between the technology-associated entities and science-oriented institutions leaving little or no space for non-science related fields which needs to be comprehensively dealt with to increase the relevance of other courses.

7. Academia Industry Interaction and NEP

At the education policy level, NEP 2020 calls for greater Industry-Academia collaboration so that ready to get employment trained manpower can be generated. NEP focuses on internship in the third and final year of graduation, the opportunities for which can be worked out by the educational institutes by collaborating with the local industries. NEP refers to granting autonomy to colleges in a stage wise manner which would facilitate greater flexibility in the design of syllabus. In consultation with industry experts, syllabus can be designed to keep pace with technological advancements and the changes required acquiring specific skill sets.

NEP also envisions the establishment of the National Research Foundation (NRF) which shall be a body that shall monitor and fund research in all disciplines. According to NEP, the NRF shall also be responsible for facilitating the implementation of research through what has been described as "close linkages" with industry and private/philanthropic organizations. The NRF will adopt the role of a liaison between industries and educational institutes for better implementation of research[29].

Keeping in line with the ideas of NEP, the UGC announced in August 2022 that colleges and universities would now have the power to hire 10% of their teaching staff outside academia. These recruits shall be known as 'Professors of Practice'. A formal academic degree and

publications will not be mandatory. Such vacancies shall be for people who have proven expertise in their field for at least 15 years[30]. Such an initiative, which is set to be implemented in the next academic year shall greatly further the cause of Industry-Academia collaboration.

8. Conclusion

In most developed countries industry and academia work in tandem, however in India a huge gap exists between these two sectors. The need of the hour is a healthy two-way collaboration between them. It's pertinent for both to realize that they need each other. Today industries are realizing the importance of joint ventures and reaching out to academic institutions for novel ideas. A number of universities are reaching out to industry for designing domain specific courses, student training and other activities which are for the benefit of students. An effective collaboration is what is needed today, when technological advancements are taking place in every domain.

It is imperative that Industry-Academia collaborations benefit the university system and the industries alike. MOU are now being signed between academia and industry to define the exact role each sector would play. India has had a slow start in this regard but is gradually catching up in terms of collaborations. Through such collaborations, the two parties mutually benefit by shared infrastructure and exchange of technical know-how. Moreover, the students in universities exposed to such collaborations become more employable. This is an essential step to bridge the lacuna between the job market and educational institutes.

In this review, we have seen examples of how industry and academia are reaching out to each other and how NEP is providing a channel to bridge the gap between academia and industry. Such an interaction will generate manpower that can analyze real-world problems and be an asset to their employer.

9. Conflict of Interest

The author reports no financial or any other conflicts of interest in this work.

10. Ethical Approvals

Ethical approvals were not required.

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