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Industry-Academia Collaboration in India: Recent Initiatives, Issues, Challenges, Opportunities and Strategies

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Abstract

Education is one of the most powerful tools for transforming the whole nation into a digitally empowered society and knowledge economy. Both education and technology are inter-connected and technology plays a crucial role in imparting education during challenging situation which is evident during the COVID-19 crisis. The global crisis of the COVID-19 virus and the subsequent lockdowns imposed by the government to control the situation has forced the people to stay indoors which has impacted the education sector tremendously. Without the aid of information and communication technology (ICT), it would have been impossible to continue the teaching-learning process during this unprecedented closure of educational institutions due to the pandemic. Information and communication technology (ICT) in learning institutions has enhanced learning by greater heights. Though students from different backgrounds especially those who are from the economically backward section of the society are facing considerable number of challenges to continue the learning process with the help of online education system still with the help of information and communication technology (ICT) educational institutions all over the world are trying their level best to address the situation. In order to keep pace with the current trend of globalization, there is a need of constantly improvising our skills. Proper implementation of the National Education Policy – 2020 in its true sense has the potential to bring remarkable changes by transforming the Indian education system. The main aim of National Education Policy – 2020 is to fill the gap of present education system which is totally mechanized which develops the cramming power of the students but curbs the individual thinking capability of the students. It also interrupts the free thinking of the students. Switching the method of

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education from rote learning to project/ activity based or experiential learning will enrich the learning experience of the learners through hands-on training experience. It will help to promote scientific temperament among the young learners.

1.0 Introduction

The National Education Policy – 2020 unveiled by the Ministry of Human Resource Development (MHRD), is a landmark policy which has revolutionized the age-old colonial system of education prevailing in India. The Indian education system is a product of colonial legacy which is primarily focussed on rote learning that led to the deterioration of the basic fundamentals of education by undermining the thinking and creative skills of the students which are creating nation of only obedient followers not leaders. Rote learning is no longer the need of the 21st century education system where people need to constantly adapt to the rapidly changing situation. In order to keep pace with the current trend of globalization, there is a need of constantly improvising our skills. Proper implementation of the National Education Policy – 2020 in its true sense has the potential to bring remarkable changes by transforming the Indian education system. The main aim of National Education Policy – 2020 is to fill the gap of present education system which is totally mechanized which develops the cramming power of the students but curbs the individual thinking capability of the students. It also interrupts the free thinking of the students. Switching the method of education from rote learning to project/ activity based or experiential learning will enrich the learning experience of the learners through hands-on training experience. It will help to promote scientific temperament among the young learners. The policy framework will further enable the policy makers to bring education reforms by re-designing the structure of education system, improving teaching methods, adopting technology as an alternative means of continuing and augmenting school/ college/ university education. During the current pandemic situation, people are forced to adopt technology as a pivotal means of imparting online education which is the need of the hour today. Rather being optional this is the only means of continuing the teaching-learning process. In the current pandemic circumstances, with virtual learning replacing in-person learning experiences, students and teachers have been compelled to re-imagine convention teaching and learning techniques. In recent years, higher educational institutions have been experiencing important changes derived from technological,

sustainable, and social trends towards digitization (Milicevic, 2015; Ghemawat, 2017). The adoption of information and communication technologies (ICTs) by educational institutions is conceived as an interconnected environment that enables student digital learning (Chen and Wu, 2020). Moreover, ICTs help learners tomake informed decisions and adopt responsible measures for the integrity of the environment and the viability of the economy. This link fosters a quality, comprehensive, and transformative education that affects content and learning outcomes (Kosmützky, 2020; Bonini, 2020).

Information and communication technology (ICT) within the field of education focuses on the design, development, and application of resources in educational processes, referring to those of a computer, audiovisual, and technological nature, as well as information processing and those that facilitate communication (Hrastinski and Ekman Rising, 2020). In these terms, educational technology arises as a set of information and communication resources, processes, and tools applied to the structure and activities of the educational system in its various fields and levels. The digital age has revolutionized every aspect of education. This trend is part of the digital transformation, which has introduced the participation of technology in education. Therefore, the incorporation of new technologies in universities has changed educational methods, that is, educational problems have a solution in the use of information technology (Arthur-Mensah, 2020), (Petrenko and Dehtiarova, 2020; Gündüz, 2020).

Impediments in Industry-Academia Interaction

Fowler (1984) has identified 15 impediments to university-industry relationships. At least two of these pose problems in establishing a practical working relationship. Firstly, academics have a desire to publish the results of their research as early as possible. On the other hand, industry zealously guards its proprietary information. Secondly, academics tend to concentrate on basic research that establishes new concepts or hypotheses. Industry's primary concern is applied research that led to product-improvement and hence to short-term profits.

The leisurely-paced approach, with a tendency to stray from original objectives that is found in universities is in marked contrast to the time-bound strategy towards a well-defined

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objective that characterizes industry. In general, in India, executives in industry are reluctant to interact with university scientists who have spent a few years in industry.

The lack of strong linkage between universities and the industry has led to the present situation where:

- The faculty, in general, have no industrial experience or exposure;
- There is not much provision for continuing education in the universities and institutions for practicing engineers to update their technology competence;
- State of art in the industry prevents flow between organized research in the universities and institutions and evolution of industrial R & D;
- There is no suitable mechanism available for collaboration in most of the department of the universities and institutions;
- Some of the universities and institutions feel constrained to accept contracts with time bound results;
- There is chronic dependence of our industry on foreign collaboration;

3.0 Removal of impediments in industry-academia interaction

The universities and professional institutions should come out of their ivory towers and interact with the outside world. Similarly, the industries should build confidence in the capabilities of the universities and the institutions and interact with them for mutual benefit. It should be recognized that the academic world, industries and R & D organizations together hold the key to the technology development in many of the core sectors of our country aims insight into the problems of industry and it provides a base for research and education. Survival of industry largely depends on the improved, innovative and new technologies and for this purpose it needs the support of the academic institutions. Unfortunately, in our country universities including technological institutions and the industry have been run on parallel lines without interaction.

During the last three decades there have been conscious efforts in India to promote cooperation between Academia and Industry. However, only marginal success has been achieved, possibly because the universities and the industrial units have not been under

any pressure to interact. In India, Industry- University partnership has been keeping low ebb over the decades. As a result of liberalization of Indian economy during current decade, we have focussed our attention on this problem. University Grants Commission of India and the All-India Council for Technical Education have adopted a concrete strategy and taken positive steps towards establishing Industry-University partnership. As per requirements of National Education Policy 1986, Programme of Action 1992, a long-lasting relationship should be established between Industry and University.

The Government of India, through number of initiatives, is devoting resources to encourage industry institute partnership. Ministry of HRD and All India Council Technical Education (AICTE) are funding projects to improve industrial relevance to educational institutions. Similarly, the Department of Science and Technology (DST) has operated the scheme of Science Technology Entrepreneurship Programme (STEP). World Bank and Overseas Development Agencies of Britain have extended support to Polytechnics and Regional Engineering Colleges, respectively, for improving the collaboration between the two sectors.

The Universities have, for the first time, been asked to generate, at least in part, their own resources, and find that they must assist business to ensure survival. It is evident that, in the coming years, industry, universities, and research institutions will, out of necessity, have to assist each other. In order to do so they will, however, have to first overcome attitudinal differences and remove some obvious impediments. With the new policy of liberalization, globalization and privatization, Indian Industries have to face stiff competition with large multi- national giants. To meet the challenges, the Indian higher technical education system needs revamping and restructuring. Not only science and technology base have to be strong but also our human resource has to rise to the occasion and meet the emerging challenges. This calls for major emphasis on close-industry-institute-partnership, resource generation and faculty exposure by the technical education institutes. The whole world has become boundary-less global economic village. Our human resource has to generate wealth and cost consumer wealth. The facilities at academic institute as well as industries have to be optimally utilized to complete the global economy.

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4.0 Recent Trends in India in Industry-Academia Linkages

Earlier, industries, academic institutions and laboratories were not cooperating well. Now, there is a trend of shift of the Indian industries for active partnership in the promotion of human resources development and sharing of facilities. The trends in Indian industries are: - **TRENDS**

Sr No.	Old/Existing Approach	TRENDS	New Approach
1	Conventional methods still in use.	→	State of the art in Technology
2	Quality of Manpower not Satisfactory	→	Better Quality of Manpower Workforce
3	Lack of involvement of Faculty with Industry	→	Greater involvement of Faculty with Industry
4	No/Less Staff exchange between Industry and Institutions	→	Increase in Staff exchange between Industry and Institutions
5	No/Less Involvement of Staff in R & D and Consultancy	→	Greater Involvement of Staff in R & D and Consultancy
6	No Compulsion and/or No/Less Incentive for Faculty to collaborate with Industry	→	Increase in Compulsion and Greater Incentives for Faculty to collaborate with Industry
7	No Linkage with Performance Appraisal of Faculty	→	Linked with Performance Appraisal of Faculty [PBAS] & [CAS]
8	No Linkage with and/or No Assessment of HE Institutions	→	Linked with UGC's NAAC / AICTE's NAB Accreditation of HE Institutions
9	No Voluntary Initiatives, Less Compulsions, No Need, No Competitions to adopt modern/ latest technology in industry	→	Increase in Competitions, Compulsions and Need, Greater Voluntary Initiatives to adopt modern / latest technology in industry
10	Retraining of manpower & workforce needed regularly	→	Retraining of workforce, a common feature

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With the liberalization of Government Policy, it is most desirable, if not essential, academics in pure and applied sciences to interact, in a professional way, with industries. Real problems do provide very stimulating subjects for investigations in universities and these involve cutting edge of sciences. There is a large scope to interact with small, medium, and large-scale industries in Private Sector including Multinationals, as well as in Public Sector, coupled with some appreciation of financial matters. The strengthening of cooperation between industries and education sector will improve the productivity, which is now a topic of current concern in our country.

5.0 Recent initiatives of CII in Industry-Academia Linkages

Indian Industry is keen to work with academia, (Forbes, 2013), for its own benefit as the quality of manpower in industry cannot be improved without focusing to quality in academia. The Confederation of Indian Industries (CII) has taken several steps in this direction including increasing the number of Ph.D. fellowships from one hundred to one thousand and funding of global innovation alliance. However, the scale of collaboration is low between these two sectors, (Forbes, 2013).

6.0 Suggestive modes of Industry-Academia Linkages

There are various ways in which Academia and Industry, (Swaminadhan D, 1990) can help each other.

A. The HE Institutes, Universities can:

- encourage, enhance, create avenues and environment for greater involvement of faculty with industry,
- encourage, enhance, create avenues and environment for staff exchange between industry and institutions,
- encourage, enhance, create avenues and environment for greater Involvement of Staff in R & D and Consultancy
- increase in compulsions and provide greater incentives for faculty to collaborate with industry,
- provide linkage with Assessment of Performance of Faculty [PBAS] & [CAS]

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- provide linkage with UGC's NAAC / AICTE's Accreditation of HE Institutions
- arrange Workshops and Training programmes for Industries to adopt modern / latesttechnology in industry
- provide training programmes for technicians, scientists and engineers,
- enter into MOUs with Industries for On-Job Training envisaged for/in Add-on-Courses/Career Oriented Vocational Courses under the UGC-Career Oriented Programme (UGC-COP).
- develop specialized continuing education programmes for updating skills and knowledge,
- set up Liaison Cells in the HEIs, Universities, that have adequate data bases, on facilities, equipment and expertise, available in the universities, as also on the type and important features of industries in the region,
- provide for representation for or invite representatives from Industries on Board of Studies, Faculties, Academic Councils, Institutes/College Local Managing Committee
- provide material characterization, testing and certification facilities,
- keep the industry informed about new discoveries/developments and innovative scientific work being undertaken,
- provide consultancy services, of a viable nature, like the development of computer software,conduct of surveys, and solving problems,
- undertake research related to technology transfer in collaboration with R & D units inindustry, and
- Help small, and medium-scale industries to induct and maintain modern technology.

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B. The Industries Can:

- provide funds to institutes for R & D and Consultancy
- assist teaching programmes by giving endowments,
- support research programmes; especially those on applied research,
- encourage, enhance, create avenues and environment for greater involvement of faculty with industry,
- encourage, enhance, create avenues and environment for staff exchange between industry and institutions,
- encourage, enhance, create avenues and environment for greater Involvement of Staff in R & D and Consultancy
- participate, in institutions initiatives in undertaking research related to technology transfer in collaboration with R & D units in industry
- make available sophisticated and costly equipment to the universities for research,
- provide financial assistance for the development of the HE Institutions, University,
- assist in the development of curricula and syllabi,
- participate in teaching programmes,
- participate in the Workshops and Training programmes organized by the HEIs/Universities for Industries to adopt modern / latest technology in industry
- participate in the training programmes for technicians, scientists and engineers organized by the HEIs/Universities,
- enter into MOUs with HEIs/Universities for On-Job Training envisaged for/in Add-on- Courses/Career Oriented Vocational Courses under the UGC-Career Oriented Programme (UGC- COP), and
- Provide facilities for hands-on training to students.

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It is believed that the Swaminadhan Model (Swaminadhan D, 1990) for University Industry R & D Organization Symbiosis, if implemented, will result in pooling, sharing and optimizing the use of resources in terms of men, material and finance in these sectors and help towards national developme nt through industrial growth. Teaching and research activities in universities get enriched. There would be better and relevant industrial R&D output and the industries will thus be well prepared to fact the global competition. For effective realization of the desired results, implementation of the Model through the suggested National Cell for promotion and coordination appears to be logical course of action.

In order to facilitate university-industry cooperation the Government of India has provided tax- concessions to industry. Thus, donations by industry to university-level institutions are eligible for 100% tax exemption, and donations supporting approved research projects in science and technology secure a 125%tax deduction.

7.0 Recommendations for effective interaction

The strengthening of institution-industry collaboration cannot come about unless there is a policy formulation by the government and educational institutions, which provides appropriate incentives and disincentives.

On the part of the government, there is already indication that tax incentives will be provided to industry for contributions to educational institutions for sponsored research and creation of facilities, or for contributions to corpus funds of the institutions. This will go a long way in encouraging interaction. These tax benefits must be very liberal if they are to make any impact. Also, they should be applicable to all institutions and all industry and not selectively.

The institutions have to take many policy decisions, which will encourage interaction. Some of these are within the powers of the colleges and institutions themselves; others will require decisions by the parent universities or even amendments to the acts or statutes. Some of these are listed below.

- There should be incentives to the faculty members who are engaged in research work sponsored by industry in terms of rewards and recognition towards assessment for

promotion.

- Institutions should set up special cells, which help liaise with industry.
- Purchase and recruitment procedures must be made appropriately flexible to enable completion of time-bound research.
- The provision of sabbatical leave should be available in more and more institutions and there should be a requirement that every faculty member spends at least one sabbatical leave in an industry.
- Institutions such as the IITs should, as a policy, consider a candidate's ability and commitment to develop collaboration with industry as an important criterion in his/her selection as a faculty member.
- Positions of Adjunct Professors from industry should be created, for which well-qualified personnel from industry should be invited.
- Faculty should be encouraged to increase their earnings from sponsored research and consultancy by appropriately raising the ceiling for such earnings.
- Faculty members should be enabled to charge part of their salary, to sponsored research funds and given a proportionate reduction in teaching responsibilities.
- Technical educational institutions should organize 'Open House' for industry, and also participate in industrial exhibitions and fairs, where their capabilities are displayed, and industry has a chance to discuss matters of mutual interest with them.

It should be realized that each institution as well as each industry has a very distinctive favour and character of its own. Plans have to be drawn up keeping this in mind. The long-term success of institute- industry collaboration will be greatly enhanced by generating examples of profitable collaboration and partnership activities and giving wide publicity to them. They will have a snowballing effect. General exhortations or directions common to all institutions or industry will not lead to a change of situation.

Only the knowledge-based Industries could be successful in the present global competitions. Hence, it is expected from the industries that for solving their problems,

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they should extend help to research programmes of the Universities, provide for costly and sophisticated appliances, adopt sponsored research development programmes, provide financial assistance to the Universities and promote teaching-training exchange programmes. Till recently, our industries have been investing only one percent of their income on research development programmes. In the circumstances, we except from the industries that they should come forward to cooperate in this task and take advantage of it. Under the changing circumstances, there is an urgent need for science, techniques, management, teaching training and exchange of facilities and information. In this situation, both the parties will be benefited.

Academia and Industry are increasingly seeing greater value in collaboration, (ASM, 2013). The academic world is eager to bring in cutting edge knowledge that practicing industry professionals can provide to bring curricula abreast of contemporary relevance. In turn, the industry is also realizing the value of collaboration, especially by exposing the faculty and students to the latest industry and technology trends and ways to improve employability of students.

In recognition of the synergistic benefits of increased academia-industry collaboration, the following initiatives, **(ASM, 2013),** can be suggested:- [a] invite on an ongoing basis, highly experienced industry professionals on to appropriate governance bodies constituted in consonance with regulatory requirements; [b] invite professionals from all walks of life as guest speakers; [c] invite domain specific leaders to lead case discussions and present industry/sector perspectives, concerns and issues; [d] Encourage faculty to participate in faculty development programmes and industry-sponsored workshops**.**

At institute level one or more of following Courses and Programmes may be developed/evolved: -

Industry Internship Programme (IIP) may be evolved, (ASM, 2013)**,** which could be of a duration of 10 to 12 weeks and an integral part of the conventional curriculum of various courses offered in the conventional Colleges. It has been uniquely structured & positioned to offer students a value-added opportunity to include work experience as part of the programme of study. The objectives for including the IIP in the programme

include: [a] learn new skills; [b] gain invaluable work experience; [c] apply classroom studies to real-life project; [d] build career network; [e] explore career options in one's area of interest. Throughout the IIP, students may be provided assistance both from the Faculty Advisor and Industry Mentor.

Business Soft Skills (BSS) courses, contiguous with the main-stream Core & Electives courses, (ASM, 2013), may be evolved. It should aim to develop the holistic personality of the student with all the incumbent skills & attributes such as high level of confidence, assertiveness, communications, leadership and work-life balance.

Competency Enhancement Programmes Along with the Foundation, Core and Electives courses, students will be encouraged & financially supported to take up function-specific Competence Enhancement Programmes leading to the award of professional Certification by accredited agencies. The scope of the Certifications will be the entire corporate education value chain that can / will impact both employment & employability.

Strong Campus to Corporate Connect Programme (CCCP) is one of the innovative initiatives for a university or a college, (ASM, 2013). It seeks to bridge the academia – industry gap, often referred to, when hiring fresh (no experience) professionals. In launching the CC programme, we seek to enhance the quality of the talent pool and produce industry-ready recruits, (ASM, 2013).

8.0 Novel and notable initiatives in promotion of industry- university collaborations

In India: SOME EXAMPLES: -

During the last two decades the IITs, IIMs, other National Institutes of Technology and some leading Universities and Colleges in India have formulated programmes to promote collaboration between academia and industry. A few illustrative examples of notable initiatives are given below:

A. Till 2010: Novel and Notable Initiatives -

The Indian Institute of Technology, Madras. A Centre for Industrial Consultancy and Sponsored Research (IC&SR) was established at IIT, Madras 1973. Industries from all

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sectors utilize the expertise and facilities of the Institute through institutional consultancy, retainer consultancy and research-based industrial consultancy. IIT Madras (IITM) Research Park is an independent company promoted by IIT Madras and its alumni and was incorporated under Section 25 of the Companies Act 1956. The IIT Madras Research Park facilitates the promotion of research and development by the institute in partnership with industry, assisting in the growth of new ventures, and promoting economic development. IIT Madras Research Park endeavour to enable companies with a research focus to set up a base in the park and leverage the expertise of IIT Madras. It is modeled the lines of successful Research Parks such as Stanford, MIT and Harvard. These technology parks have been known to add value and impetus to industry and business enterprises. The IIT Madras Research Park assists companies with a research focus to set up a base in the park and leverage the expertise available at IIT Madras.

The Mission of IITM Research Park is "To create a knowledge and innovation ecosystem through collaboration between the industry and academia to enable, encourage and develop cutting edge technology and innovation that exceeds the global standard". The ongoing technology transformation is opening up vast vistas of innovation and entrepreneurial opportunities**.** The "knowledge and innovation ecosystem", the Research Park breaks down the traditional, artificial barriers of innovation through its connectivity and collaborative interaction. This helps the industry to create, integrate, and apply advancements in knowledge. The resulting synergy leads to matchless technological innovation and transfer. In 1992 the value of consultancy assignments exceeded Rs.20 million (Natarajan 1993). The role being performed by the IIT Madras Research Park, is simply praise worthy, (Pallam Raju, 2013a). The macro guiding principles behind the park are:

- Creating a collaborative environment between industry and academia through joint researchprojects and consulting assignments
- Developing a self-sustaining and technologically fertile environment
- Encouraging and enabling the alignment of R& D activities to potential needs of the industry

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- Providing world class infrastructure for R& D activities
- Enabling development of high-quality personnel and motivating researchers to grow professionally within organizations through part time Masters and Ph. D. Programs
- Aiding technology and business skills sharing between the university and industry tenants.

The Indian Institute of Technology Delhi, IIT Delhi, established a Foundation for Innovation and Technology Transfer (FITT). It acts as an interface between the institute and industry. It offers programmes of product development; technology initiatives, technology advancement, and human resource development; as also services in technology extension, future visions, information support, and strategic planning and management (Natarajan 1993).

The Birla Institute of Technology and Science, Pilani: - The BITS. Pilani has created a number of institutionalised linkages with industry. Under its practice school programme, the students of the first degree in engineering attend two courses in industry. PS-I is for two months after the second year and PS-II for 5-1/2 months for the final year. In addition, it has developed Distance Learning Programmes, for persons working in industry leading to B.E., ME., M.Phil. and Ph.D. Degrees. It has also developed a Technology Innovation Centre where persons from industry can spend time to update their knowledge (Venkateswaran, 1994).

The Tiruchi Regional Engineering College, Tiruchi: - Set up in 1989 by the Department of Science and Technology the Tiruchi Regional Engineering College Science and Technology Entrepreneurship Park (TRECSTEP) conducts one-month long entrepreneurial development programmes. It has 64 industrial units set up by those who have undergone training at TREC- STEP. It also imparts training to youth under the Mass Employment Generation Programme. (Ganapathi, 1994).

University of Pune, Pune: - The University of Pune established Science, Technology and Entrepreneurship Park (UPSTEP) in 1986, to provide test and certification facilities and consultancy services. It has made significant achievements in high-power silicon devices,

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surface modification and microprocessor-based instrumentation (University of Pune, 1992).

[B] Since 2011: Very Recent Novel and Notable Initiatives -

MoU between NASSCOM and UGC: - NASSCOM signed an MoU with the UGC to jointly undertake a Faculty Development Programme for upgrading the skill-sets and knowledge base of the existing technical faculty. Foreseeing the growing demand for skilled professionals, NASSCOM and the UGC have begun to work together to increase student and faculty interface with the information technology industry by way of mentorship programmes, workshops, seminars, and projects.

MoU between NASSCOM and AICTE: UPDATING SKILLS: Expertise in software is being benchmarked: - A Memorandum of Understanding (MoU) has been entered in 2012, between the National Association of Software and Service Companies (NASSCOM) and the All-India Council for Technical Education (AICTE) to develop a manpower base for the software and ITES sector, (The HINDU, 2013). The interface between the country's IT industry and academia is no longer sluggish.

It has been given a boost, especially with the NASSCOM signing memorandums of understanding (MoUs) first with the University Grants Commission (UGC) and later with the AICTE. The accord with AICTE is expected to give an impetus to NASSCOM's ongoing IT Workforce Development Initiative, thus strengthening the country's technical education through curricula, faculty, and infrastructure and pedagogy improvements. As per the agreement, NASSCOM will help AICTE in projecting the manpower requirements of the industry. Both bodies will jointly undertake initiatives such as curriculum review, training modules, database, and study international models. The MoU also looks forward to catalyzing the interface between the industry and academia through specific programmes, and exploring alliances and programmes for specific initiatives with corporate, academic associations and consultancy firms. This academic collaboration has come as part of NASSCOM's mission to equip two million professionals for IT and IT-enabled service sectors with industry-relevant skill sets by 2010. "Education, and nothing else, is the future of the country." The primary objectives

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of the initiative with AICTE are to identify the needs of the IT industry in terms of the number of people, skill sets and quality in various disciplines at different levels. Strengthening Indian professional education in line with the IT industry's requirements is felt more strongly today than ever. Direct interaction with the academia was the only way out to meet the challenges that the BPO and IT industry would pose in the immediate years. It is the need of the day that Indian universities and technical institutions to increase their pace of functioning and include the latest concepts in their curricula. Educational experts point out that academia and industry represent two different cultures and straightening the mismatch between the requirements of both is a challenge most countries face. This is where NASSCOM's initiative with AICTE gets added significance.

Higher Education Forums: Regional Intel Higher Education Programs Regional Intel Higher Education programs (RIHEP) provide a venue to foster interaction between Intel and leading universities worldwide, {RIHEP, 2013). Initiated in Europe in 1996, these forums have served to allow university faculty and researchers direct access to Intel technologists and additionally provide a forum for university participants to highlight their own ongoing research and curriculum topic interests.

BIRAC and ABLE Strengthen Collaboration by Signing a MoU:- Biotechnology Industry Research Assistance Council (BIRAC)$ and Association of Biotechnology Led Enterprises (ABLE)# entered into an Understanding whereby ABLE would seek to facilitate the effective and efficient delivery of BIRAC's mandate by providing critical inputs on various aspects that are concerned with technical knowledge, Interactions with the private biotech industry, inputs for policy making, dissemination of schemes through workshops and seminars. India is a large economy that aspires to develop a vibrant and significant Bio-economy. The aspirations of the industry are to grow at a CAGR of 30% till 2025. For that, to happen the industry needs to communicate its requirements to the Government so as to enable the government to respond by putting facilitative policies and mechanisms in place. There in a need for all stakeholders to move and work in tandem. It is expected that these efforts would encourage biotech start-ups to convert

innovative research in public and private sectors into viable and competitive products and enterprises and provide indispensable support for all stakeholders. Public Private Partnerships are the norm in almost all sectors and need to be done in a manner that is sustainable and that leads to maximum benefits in terms of the end products or services that are useful in mitigating current and future problems of health, food and environment. The association of ABLE already has a meaningful engagement with BIRAC and this broad understanding paves the way for several more programs and projects on which the two institutions can now work together, (Murali, 2013). Partnership is a key philosophy of BIRAC and BIRAC looks forward to ABLE being a knowledge partner of BIRAC to bring the industry perspective forward", (Swarup, 2013).

About BIRAC: -The Department of Biotechnology, Ministry of Science & Technology, GOI, set up (BIRAC, 2013) 'Biotechnology Industry Research Assistance Council' [BIRAC] which was incorporated on 20 March 2012 as a Public Sector Section 25 'Not-for-Profit Company' to promote and nurture innovation research and growth of the biotech industries through gap filling interventions that facilitate high risk research, innovation and product development. This incorporation of BIRAC was a result of a landmark decision of GOI taken 20 November 2012 to create this unique organization, viz., BIRAC. This decision of GOI was pursuant to a policy statement made in October 2007 by the Dept. of Biotechnology, Min. of Science & Tech. GOI that Public Private Partnership [PPP] would be promoted and a separate organization would be set up to nurture and promote industrial R&D innovation.

The **VISION** of the **BIRAC** is ***"****Stimulate, foster and enhance the strategic research and innovation capabilities of the Indian Biotech Industry, particularly start-ups and SMEs, for creation of affordable products addressing the needs of the largest section of society*". The MISSION of the BIRAC is *"Facilitate and mentor the generation and translation of innovative ideas into biotech products and services by the industry, promote Academia - Industry Collaboration, forge international linkages, encourage techno entrepreneurship and enable creation and sustainability of viable bio-enterprises"*. One of the primary MANDATES of the BIRAC is "*to trigger, transform and tend biotech start-ups to convert*

innovative research in public and private sector into viable and competitive products and enterprises".

The key PHILOSOPHY of the BIRAC is *"to foster innovation and promote the translation of discovery and exciting new inventions to market ready technologies and products"*. To achieve its aim, BIRAC works in partnership with private, public and international agencies. BIRAC is a unique organization, the only of its kind, set up to nurture and support growth of the biotech sector, having a very special and unique governance structure for successful and effective functioning. As a Government of India enterprise, BIRAC endeavours to bring professionalism, transparency and efficiency into its functioning while providing support to catalyse the transformation of the emerging Indian bio-economy. It has very carefully developed its workforce strategy that includes an enabling work environment, a work culture that is caring, fosters excellence and hires the most talented and professional workforce. In its *First* year of existence, the BIRAC has initiated several schemes, networks and platforms that help to bridge the existing gaps in the industry-Academia Innovation Research, and facilitate novel, high quality affordable products development through cutting edge technologies. BIRAC has initiated partnerships with several national and global partners to collaborate and deliver the salient features of this mandate. The BIRAC's continuous endeavour is to provide value to the crucial and critical steps in converting discoveries to product. While the public sector scientists concentrate on developing early leads. Close interaction and partnership with the industry are essential to translate these into products. BIRAC through its investment schemes provides necessary opportunities to the Public Sector Researchers, 1st generation entrepreneurs, early starts-ups and SMEs to take forward their discovery and innovation research and work together to promote affordable innovation in key social sectors and through commercialization of the discoveries, ensure global competitiveness of the Indian enterprise.

The **BIRAC**'s **efforts** are to empower, enable and catalyse the innovation driven biotech enterprise to fulfill India's Vision of a **"US $ 100 billion Biotech Industry by 2025"** and create a true **"Indian Bio-Economy"**. Thus, **BIRAC is a new industry- academia interface** and implements its mandate through a wide range of impact initiatives, be it

providing access to risk capital through targeted funding, technology transfer, IP management and hand-holding schemes that help being innovation excellence to the biotech firms and make them globally competitive.

About ABLE Association of Biotechnology Led Enterprises - **ABLE** is a not-for-profit pan-India forum that represents the Indian Biotechnology Sector. It was launched in April 2003, after industry leaders felt a need to form an exclusive forum to represent the Indian Biotechnology Sector. It has over 270 members from all across India representing all verticals of the sector like agri-biotech, bio-pharma, industrial biotech, bioinformatics, investment banks and Venture Capital firms, leading research and academic institutes and law firms and equipment suppliers. The primary focus of ABLE is to accelerate the pace of growth of the Biotechnology sector in India, through partnering with the Government in their biotechnology initiatives to deliver optimal policies and create a positive regulatory environment, encouraging entrepreneurship and investment in the sector, providing a platform for domestic and overseas companies to explore collaboration and partnerships, forging stronger links between academia and industry and showcasing the strengths of the Indian biotech sector. In the past decade ABLE has played a significant role in catalyzing the growth of the biotech industry by facilitating advocacy, collaboration, investment and encouraging entrepreneurship. Some of the milestones that ABLE has achieved are those related to Dr. Mashelkar Committee report on recombinant product, Innovative programs of the DST viz. BIRAP and BIPP, Vision document for the Indian Biotech industry, Roadmap for the biotech Industry, building the Biotechnology Entrepreneurship Students team (BEST) and North East Life Science Entrepreneurship (NEST) programs, the Bio-Invest Program and the International promotion of Brand India through organizing the India Pavilion in various BIO Shows.

9.0 Summing up

Higher Education contributions to the country's development are well recognized. It is a powerful tool for social, political and economic change. Its significance as source of new knowledge and competent manpower for all sectors of economy cannot be over emphasized. Over the last five decades there has been phenomenal expansion of the higher education system. Yet in the fast-changing socio- economic context, the higher education

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system will be exposed to still greater pressures for expansion. It may be because of demands for social equity and justice, for providing a training ground for skilled manpower to meet the needs of expanding industry, trade and commerce or for self employment, for initiating and managing social change, or just for intellectual curiosity.

Educational process is to be linked with production and employment on the one hand and application of R & D. Re-orientation of the educational programme should be undertaken in such a manner that it helps to produce self-reliant and self-dependent citizens. India has recognized the need for fundamental educational reforms and developing linkages between academia and industry.

India is steadily shifting to a fast tract of economic and industrial development, which leads to mounting demands on education and calls for a highly diversified human resource. Already India is witnessing several paradigms shifts in the social, business and industrial environment. The shift from low tech to high tech, national to global, production to service economy, state to private sector, and the changing occupational patterns create demand for a new work force with a different skills profile than was demanded in the yesteryears. The onus of making available this resource lies on our system of higher education. This supply of competent human resource is vital for our economic restructuring and achieving global competitiveness.

If all the available human resources are to be discovered and developed, a system of education based on sound principle of social justice is very essential. Human development is the end economic growth a means. So, the purpose of growth should be to enrich people's lives. But far too often it does not. The recent decades show all too clearly that there is no automatic link between growth and human development. And even when links are established, they may gradually be eroded unless regularly fortified by skilful and intelligent policy management.

It is only in recent years that steps have been taken in India to establish linkages between academia and industry. The initial results are encouraging. However, there is need to exercise caution while signing a 'Memorandum of Understanding' (MoU). The programmes need to be meticulously planned and organised, with effective monitoring mechanisms, and

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with realistic time-scheduling. The responsibilities of both partners need to be clearly defined and there has to be easy communication between the two. Otherwise, there is the danger of having further examples of failed ideas leading to loss of confidence in the process.