

## Industry-academia collaboration in India: Recent initiatives, issues, challenges, opportunities and strategies

M.M. Gandhi

*Jaysingpur College of Arts, Commerce, Science and Computer Science  
Maharashtra State, India*

### Key Words

National Policy on Education, UNESCO, Industry-Academia Collaborations, Skills and Needs of industries, Skill Development, Roll of Government Higher & Technical Education, UGC, AICTE, National level Institutes of Higher Learning, IIMs, IITs, Polytechnic Institutes, ITIs, Universities, Colleges, Industries.

### Abstract

*This comprehensive paper deals with the efforts made, recent trends in, and critical issues pertaining to Industry-Academia Collaborations in India with special reference to National Education Policy (NPE) 1968, National Education Policy (NEP) 1986, Programme of Action (POA) 1992, and the goals of education laid down for India in the Constitution of India.*

*This paper argues that there is a great need for Industry-Academia partnership. Collaboration between academia and industry has been rather restricted in India, in the past, possibly because of differences in values and attitudes, lack of appreciation of each other's abilities, skills and needs, and the absence of economic compulsions. It was so in the past and will be felt in future also. The students of Higher Education are not getting desired practical benefits of education. This is equally applicable to the students of technical education also.*

*This paper elaborately discusses on the emerging trends in Industry and Academia Collaboration and efforts made and role being played by/on the part of all concerned. This paper suggests various modes, modalities, methods of the Industry and Academia Interaction.*

### 1.0 Introduction

The impact of globalization on Indian Economy, emergence of the free market, formation of international trading blocs, development of new technologies with low half-life periods, the advent of Information Technology and Bio-Technology and the necessity of improving quality to meet the requirements of international markets, have greatly affected business, and forced industry to look for support from academia. On the other hand, the Government, policy makers, educationist, etc., have realized that of there is an alarming situation and truth of consistently increasing unstopable number of unskilled and unemployed youth generations due to the existing pattern of education, and hence, planned efforts are essentially required to make the existing education more meaningful for skill development to make the educated youth self-employed by improving their employability. The resultant situation was/is that during the last four 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. Recent events have, however, changed the situation.

Initially, it was the approach, attitude or rather convenient concept and understanding of all concerned (including policy makers, expert bodies, educationist, educational institutes, industrial sector, banks, etc.) that the task / function to create a skilled labour, is assigned or bestowed only upon the Technical Institutes, such as IITs, Polytechnic Institutes, ITIs, etc. However, after late realization by the Government, policy makers and educationist, of the

alarming, frightening, fear-provoking unavoidable truth of consistently increasing unstoppable number of unskilled and unemployed youth generations from the then and still existing pattern of education, particularly higher education, there was swift change in the above-explained approach, attitude or rather convenient concept and understanding. The result of this late realization was that, the Higher Educational Institutions especially conventional Universities and Colleges [HEIs] have recently been asked to change the curricula and/or introduce Add-on-Courses, so as to provide On-the-Job-Training by entering in to collaborations with the 'Industry', with an objective for skill development to make the educated youth self-employed by improving their employability. These HEIs have also 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.

Excellence, modernization, collaboration and self-reliance are the four crucial elements in the development of Higher and Technical Education. These factors should not be viewed in isolation but in relation to each other with the ultimate objective of attaining excellence. Higher Education is directly concerned with providing leadership in various vocational, industrial, social and economic areas, determining the policies of modernization.

## **Review of Literature**

### **[A] UNESCO Reports**

The UNESCO report (1997) 'Learning To Be' states as under:-

*"The correlation and collaboration between society and education are so complex that simplified explanations cannot possibly give an adequate account of them. This remark is valid for the tasks which education assigns to society and society to education reciprocally and also for statements concerning the objectives to which such tasks are designed to lead".*

Describing education as an image of society, this report has added that education being a sub-system of society, necessarily reflects the main features of that society. It would be vain to hope for a rational human education in an unjust society.

UNESCO has in the last decade put out a policy paper, (UNESCO, 2002), entitled '*Strategies for Change and Development in Higher Education*'. It has four themes: (i) Views on Trends and Challenges: Interpretations of Context and Setting; (ii) Responses Relevance for Higher Education; (iii) Quality in Higher Education; and (iv) Internationalization of Higher Education.

For the last few years, UNESCO has been engaged in a worldwide reflection on the role, main trends and challenges facing higher education. This is a part of a broader process which aims to reinforce its role and function in the light of the profound political, social, economic and cultural development and transformations that faced society at the end of 20<sup>th</sup> century and the beginning of the next millennium. The policy paper is a contribution to the ongoing debate on higher education. It synthesizes what UNESCO sees as the key policy issues to be dealt with at the global, regional, national and institutional levels.

### **[B] Education in the Constitution of India**

The Constitution of a country is the basic document, which may be regarded as the source of legislation. The Constitution of India similarly has provided a large number of clauses and articles, which have a direct or indirect bearing on education. The Constitution contains the educational philosophy of the Indian people. It embodies the ideals, hopes, values and aspirations of the people of India. It is the fundamental law of the land. Naturally education

should find an important place in this great document. Many provisions of the Constitution have direct or indirect bearing on education.

The Preamble of the Constitution of India contains aims and objectives of India's national policy. It is a guideline and a solemn pledge given to the nation. The Constitution has set forth the goals of India's educational institutions. Its Preamble has reflected the national ethos, values and aspirations and enjoined the objectives of national policy. It has given the directions in which the nation would go ahead and achieve its aims.

The national goals as envisaged in the preamble to the Constitution indicate the vision of the nation and every citizen owes his allegiance to it. Democracy, socialism and secularism emerge and guide the national activities. The imperial system of education intended to prepare and army of ministerial assistants is to be modified and reoriented to reflect the national ethos and aspirations. This re-organized and re-orientated educational system is operative for preparing the future citizens of the country.

### **[C] Indian Educational Policy Documents**

The Kothari Commission (1964-66), also observed, and stated:-

*"One of the important social objectives of education is to equalize opportunities enabling the backward and under-privileged classes and individuals to use education as a lever for the improvement of their conditions. Every society that values social justice and is anxious to improve the lot of talent must ensure equality of opportunity to all sections of society".*

The National Policy on Education of India (1986) characterizes higher education as a "crucial factor for survival" providing the Indian people with an "opportunity to reflect on the critical social, economic, cultural, moral and spiritual issues". It is envisaged in the National Policy on Education of India 1986 [NEP 1986] and Plan of Action 1992 [POA 1992] that education will be used as an agent of basic change in socio-economic status of people.

The NEP 1986 and POA 1992, state that, "the new policy will lay special emphasis on the removal of disparities and to equalize educational opportunity by attending to the specific needs of those who have been denied equality so far". The objectives specified in the NEP are in the best interests of a democratic society and for the first time "equality" is prioritized over other things. The policy statement seeks to remove inequalities based on gender, race, religion, region or cast together with an improvement of quality.

### **[D] Policy Statements of Government of India**

The need for institution-industry collaboration has been foreseen in various policy statements of the Government of India. During the preparation of the National Policy on Education, a document entitled "Challenge of Education - A Policy perspective" was prepared by the Ministry of Education which had noted that "the collaboration between industry and technical institutions, which is so crucial for ensuring relevant quality and cost-effectiveness, remains weak despite exhortations for closer co-operations". Subsequently the National Policy on Education adopted by the Parliament in 1986 emphasized the need for the collaboration by stating that:-

*"The curricula of technical and management programmes will be targeted on current as well as the projected needs of the industry or user systems. Active collaboration between technical or management institutions and industry will be promoted in programme planning and implementation, exchange of personnel, training facilities and resources, research and consultancy and other areas of mutual interest... Networking will have to be established between technical education and industry, R & D organisations, programmes of rural and community development, and with other sectors of education with complementary characteristics".*

The Technology Policy statement, (DST 1993), prepared by the Department of Science and Technology in 1993 for widespread dissemination had emphasized the collaboration between engineering educational institutions and industry through statements such as:-

*“Attention will be directed to further enlarge the base of polytechnics, technical and vocational institutes, and engineering institutions and launch programmes for training and retraining industrial and technical personnel in numbers significantly more than what has been attempted hitherto. Industries will be involved in this process of upgrading the human skills...Pursuit of R & D as a career prospect will be deliberately encouraged through further concrete measures so as to attract scientists and technologists to the challenges of creative science and innovative development with a target of doubling their number in R & D by 2000 AD.”*

The Technology Policy statement, (DST 1993), further stated that *“In view of such predominant role being envisaged for Research, Design and Engineering (R&DE) in the coming years, continual examining and reorienting the work programmes of the R&D institutions are necessary, based upon the emerging needs of the country and the areas where large foreign investments are taking place or substantial foreign technological inputs are needed. The linkages with industry, markets, customers and feedback and feed-forward research would become important and mechanisms to achieve these would be provided for”.*

The DST Policy Statement 1993, which still after 20 years has relevance and much significance, had suggested various steps for encouraging collaboration, which include:

- Funding national laboratories and academic institutions through linked projects;
- Promoting university-industry linkages by diverse means, including adjunct positions for necessary personnel;
- Encouraging use of national laboratory facilities and their expertise by industrial units by way of contract research projects appropriately paid for by the industry;
- Developing the consortium approach involving academic institution, national laboratories, including those of the mission agencies namely, Department of Atomic Energy, Space, and Defence Research and Development, wherever feasible, and the user industry, for goal oriented programmes and new product development;
- Facilitating easy mobility of personnel among universities, laboratories, industry (including R&D institutions connected with industry), and the Ministries; and
- Assigning multi-dimensional responsibility to the existing technical institutions.

State Governments of India have been assigned a special role in encouraging R&DE and in providing linkages at the local levels. The DST Policy Statement 1993- document further states in the context of Policy Implementation that *“R&D institutions including academic institutions would be encouraged to interact with industry and other agencies for contract projects. Income arising out of such initiatives will become additional resources for furthering their infrastructure and other R&D activities... All measures will be taken to accelerate the process of transformation of a laboratory technology to an industrial operation through strengthening and involvement of design, consultancy, and project implementation groups”.*

### **3.0 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 lead 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 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;

#### **4.0 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 multinational giants. To meet the challenges, the Indian higher technical education system needs revamping and restructuring. Not only science and technology base has 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.

### 5. Recent initiatives of mhrd government of india

India needs closer partnership, (Pallam Raju, 2013a), between academia and industry. The most of the funding at present for Research and Development in the country is coming from the Government side. There is an urgent need for more contribution from industry in research, besides greater private sector involvement. The industry should engage itself more in terms of not only funding but also in skill development, innovation and entrepreneurship. The gap between the academia and industry has to be bridged to enhance employability of our people. While China spends more than one and a half per cent of its Gross Domestic Product on research and development, India spends less than one per cent, (Pallam Raju, 2013a).

The Ministry of HRD, Government of India (MHRD), has set up three task forces on, (a) Research, innovation and entrepreneurship (b) skill and employability and (c) the ways to foster institutional mechanism, (Thakur 2013). The recommendations of these task forces are of wider perspective. The Government is keen to promote top end research for skill building and the plans to foster ties with academia, industry and the Government. It will come up with a plan within two hundred days, (Thakur 2013).

There is a need to **transform our institutions from centres of knowledge dissemination to hubs of knowledge creation**, (Pallam Raju, 2013b). While there are many priorities before the MHRD, the three areas requiring top-most attention are: [a]. Improving learning outcomes at all levels; [b] Meeting the shortage of faculty/ teachers at all levels; [c] Industry-academia linkages to ensure better employability of our graduates as also skilling of our youth.

In higher education, increasing the Gross Enrolment Ratio (GER) from the present 18.8 per cent to 25.2 by 2017 and reaching 30 per cent by 2020 is a major priority. A national mission on teachers and teaching is also being launched to address current issues such as a lack of availability of qualified teachers and to attract talent into the teaching profession. The Ministry of HRD has notified the National Vocational Qualification Framework (NVEQF), where professional education imparted by the technical institutions under the university system and polytechnics under the technical boards will provide basic skills required for transforming students as employable, (Pallam Raju, 2013b).

The Ministry is setting-up an 'Academia-Industry Interface Council'. The Academia-Industry Interface Council is an important initiative where we want to promote cutting-edge research, improve the quality of teaching-learning processes and improve employability of our graduates. The corporate sector can collaborate with the academia with varying funding commitments - ranging from direct ownership and management of institutions to collaborating with higher education institutions in research, faculty development, infrastructure creation, student scholarships and governance. The recommendation by the Narayana Murthy

Committee to set up the 'Council for Industry and Higher Education Collaboration' (CIHEC) to facilitate industry-institute collaborations is indeed the way forward, (Pallam Raju, 2013b).

Many students who venture into the corporate world aren't job-ready. The MHRD has taken steps to **increase their 'employability quotient'**, (Pallam Raju, 2013b). The current university education framework develops the student's analytical, reasoning and logical skills, but is unable to develop employability skills so as to develop him in a position to find meaningful employment.

Our university curricula are redundant. It is also true that there are gaps in our education system. Various initiatives to promote industry interaction, mandatory internships, setting up of research parks, etc. have helped in improving the overall entropy within the system. The MHRD has taken several policy decisions to introduce finishing school programmes as supplementary training schools to enhance employability, (Pallam Raju, 2013b).

With an aim to **strengthen the industry-academia tie-up**, the MHRD has taken **steps for setting up of an 'incubation fund'**. To have an industry incubation fund is worth considering though the operational and logistics details need to be worked out. The All India Council for Technical Education (AICTE) also has initiated a scheme where one crore rupees will be provided for starting an incubation centre on the campus if there are matching grants available from the industry. The institute will need to provide about 2500 - 3000 sq ft on the campus for this to happen. Cluster colleges can also participate in this. Research parks, like, IIT-Madras, will also play an important role, (Pallam Raju, 2013b).

The MHRD has taken steps to **address the employability gap in Tier 2 and 3 cities**. The MHRD has set up several new higher and technical institutions, including polytechnics during the XI Five Year Plan, which covers the Tier 2 and 3 cities. In addition, the Technical Education Quality Improvement Programme (TEQIP) is bringing about a quality infusion and strengthening the soft power of our state engineering institutions. Recognising the need for IT skills of different sectors, the MHRD is setting up 20 new Indian IT institutes in the XII plan period, (Pallam Raju, 2013b).

The MHRD has taken **steps to create universities of an international repute in India** as there aren't many Indian institutions in the top world rankings. It is necessary to enhance the research capabilities of our institutions and also make them centres of 'knowledge creation' rather than 'knowledge dissemination'. The MHRD is in the process of enabling institutions to have collaborations with other institutions globally, so as to help them evolve as 'centres of excellence'. The MHRD is also establishing 50 centres of excellence in frontier areas of science, (Pallam Raju, 2013b).

There is a **need for greater private sector involvement**. The **industry should engage itself more in terms of not only funding, but also skill development, innovation and entrepreneurship**. The target to enhance access to higher education by creating ten million additional seats aligned to the skill needs of the economy, calls for more innovative and viable modes of funding higher education. The National Vocational Qualification Framework (NVEQF) offers students an alternate path that can offer employment and provides an opportunity to acquire a degree or diploma. Skill building can only be imparted by the industry or its associates. The same needs a greater involvement of the industry not only in providing skills, but also in promotion of innovation and encouragement of entrepreneurship among our youth, (Pallam Raju, 2013b).

The MHRD will also launch the **National Employability Enhancement Mission (NEEM) through AICTE**. The objective of NEEM is to offer on-the-job practical training to enhance the employability of a person either pursuing his/her graduation/diploma in any technical or non

technical stream or someone who has discontinued his/her degree or diploma course to increase employability. Any society/trust/company registered under section 25 of Companies Act, 1956 shall be eligible to apply for registration as a NEEM agent. It is expected by the Ministry that this NEEM initiative will bring the educational institutes and industry together for training, internships and consequently better employability, (Pallam Raju, 2013b).

It is necessary to enhance the spending on Research and Development (R & D). India spends less than one per cent, (Pallam Raju, 2013), of its Gross Domestic Product (GDP) on R & D, while China spends more than one and a half per cent of its GDP. It is necessary to create atmosphere for promoting the industries- academia collaborations in the country for greater national productivity.

The Ministry of Human Resources Development (MHRD) has announced key initiatives to promote industries- academia collaborations in the country for greater national productivity, (Pallam Raju, 2013). MHRD will set up an Incubation fund for 100 institutions. The fund will provide seed money for incubating ideas of students and facility. MHRD is launching the National Employability Enhancement Mission (NEEM) through the All India Council of Technical Education (AICTE). The framework will provide a vehicle for companies and entrepreneurs to provide employability skills and internship as value added proposition to student for all fields.

MHRD will set up an Academia- Industry Interface Council with representatives of Industry and Academia. The council will promote collaboration between the two and create and innovating culture. MHRD will identify ten institutes with potential to have Research Parks at tier one, two or three level, depending on the optimum size industry presence and current level of academia- Industry engagement in the institute. As in the case of IIT Madras Research Park, while the initial funding would come from government, the research park would be expected to raise resources from the market and generate its own revenues later on.

MHRD will explore the possibility of funding for research on competitive basis for national priorities where Industries-Academia collaborates. It has begun documenting case studies as an MHRD-CII collaboration initiative. MHRD will recognize good works of collaboration between industry and academia through annual awards. In coordination with Industry, MHRD will put in place a mechanism to invite applications for best outcomes of Industry- Academia partnerships. The gap between Industry- Academia has to be bridged to enhance employability of our people.

There is a need for more contribution from industry in research, since, the funding at present for Research and Development in the country is coming from the Central Government side. The industry should engage itself more in terms of not only funding but also in skill development, innovation and entrepreneurship. The good work of collaboration between industry and academia would be recognized through annual awards.

Thus, Key Initiatives to promote industries- academia collaborations in the country for greater national productivity are:-

- An Incubation fund will be for 100 institutions, which will provide seed money for incubating ideas of students and facility.
- The National Employability Enhancement Mission (NEEM) will be launched through the All India Council of Technical Education (AICTE). The framework will provide a vehicle for companies and entrepreneurs to provide employability skills and internship as value added proposition to student for all fields.
- An Academia- Industry Interface Council with representatives of Industry and Academia shall be set up;

Ten institutes with potential to have Research Parks at tier 1,2 or 3 level depending on the optimum size industry presence and current level of academia- Industry engagement in the institute to be identified;

As in the case of IIT Madras Research Park, while the initial funding would come from government, the research park would be expected to raise resources from the market and generate its own revenues later on;

The Ministry will explore the possibility of funding for research on competitive basis for national priorities where Industries-Academia collaborates. It have begun documenting case studies as an MHRD -CII collaboration initiative;

Good works of collaboration between industry and academia will be recognised through annual awards;

In coordination with Industry, MHRD will put in place a mechanism to invite applications for best outcomes of Industry- Academia partnerships. The gap between Industry-Academia has to be bridged to enhance employability of students. Three task forces shall be set up, namely, [i] Research, Innovation and Entrepreneurship; [ii] Skill and Employability; and [iii] The ways to foster institutional mechanism; Top end research for skill building shall be promoted; Plans to foster ties with academia, industry and the Government, which will come up within two hundred days, are being prepared. The number of PhD fellowships from one hundred to one thousand shall be increased by the CII; Funding of global innovation alliance has been undertaken by CII.

Promotion of the Industry-Academic Collaboration, (Komakula, 2013), is definitely the need of the hour to enhance and up-grade the employability skills of the students in long run. The proposals announced by the Minister MHRD are simply praise worthy. The establishment of National Employability Enhancement Mission under the aegis of All India Council for Technical Education is a good move for the promotion of the skill development, innovation, and entrepreneurship. Linkage of the Technical Educational Institutions with the Industry tycoons, will give exposure to the students to get proper knowledge and skills for gainful employment. Qualitative Education linked with practicality in Industrial sector, will benefit the student community on large scale generation of employment. Let us hope that this move by the Government will yield good results in our younger generation to cope up with the possibilities that are necessary for greater National productivity.

Skill Development is a huge need in India as there is a severe lack of vocational training being imparted, (University News, 2013b). It has been proposed by the MHRD to set up at least 100 Community Colleges, with a strong base of Industry-Academia Partnership. The said move has been based on the recommendations that a system of Community Colleges on the lines of America be adopted in context of Polytechnics, and indeed some progress in this area has taken place in the XI Plan, administered by IGNOU. The process needs to be continued and expanded however as there is still yawning gap between the current skilled workforce and what is actually expected and needed by the Industry.

The Research Park, Council of Industry-Academia Partnership, (Naik, 2013) are most needed. Only class room teaching although good is not enough to enlarge imagination and creativity of students. Industry all alone cannot achieve peak performance with out the support of institutes and vice versa. They both must synergize their efforts. Companies even though they have R&D centers cannot do all the research they need to be competitive in global markets. They must think in long range and draw benefits from Academic Institutes. Academic Institutes have brains, laboratories, and library to do research. But inputs from industry are needed. MHRD is on right track if they show the way. Industries should encourage, (Bhartiya, 2013), their

employees to enhance their knowledge by doing M. Tech., Ph.D. in IITs, IIMs, Universities, etc. This way productivity and enhancement and performance go hand in hand. Unfortunately the practice is limited for the same in some sectors and people do not get advantage to grow or have choice of career.

## 6. 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

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.

## 7. 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).

### **8. 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]
- provide linkage with UGC's NAAC / AICTE's Accreditation of HE Institutions
- arrange Workshops and Training programmes for Industries to adopt modern / latest technology 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 in industry, and
- Help small, and medium-scale industries to induct and maintain modern technology.

#### **[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.

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 development 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 face 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.

## 9. 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, 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 expect 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 (CCCCP)** 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).

## **10. 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:

### **[B] 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 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 research projects 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
- 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 TRECSTEP. 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, 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 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)<sup>s</sup> and Association of Biotechnology Led Enterprises (ABLE)<sup>#</sup> 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 is 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).

(4.1) **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-up's and SME's, 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, 1<sup>st</sup> generation entrepreneurs, early starts-up's 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.

(4.2) #**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.

## 11.0 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 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 paradigm 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 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.

### Reference Material and Acknowledgement

The author has extensively used several private and official documents, articles, research work, reviews, journals, periodicals, newspapers and books while preparing this paper. The entire list of reference materials is given in alphabetical order. Grateful acknowledgement is made to all known and unknown (in case of official documents) authors and publishers.

### References

- Abdul Kalam A P J (1998), 'Vision for the Nation', University News, Vol.36 (9), March 2, 1998, AIU Publ., New Delhi;
- Abdul Kareem S. (1999), 'Information Technology and Knowledge', University News, Vol.37 (42), Oct.18, 1999, AIU Publ., New Delhi;
- Aggarwal J C (1984), Landmarks in the History of Modern Indian Education, Vani Publ., New Delhi;
- Aggarwal J C (1990), Development and Planning of Modern Education, Vikas Publ., New Delhi;
- Arya S (1995), 'University-Industry Linkage', University News, Vol.XXXIII (15), April 10, 1995, AIU Publ., New Delhi;
- ASM Brochure, (2013) Brochure of Acharya School of Management, Bangalore, June, 2013, Retrieved from : [http://www.careers360.com/profiles.aspx?pr\\_id=29](http://www.careers360.com/profiles.aspx?pr_id=29)
- Bajaj KK (1997), 'Introspect on Higher Education', University News, Vol.35 (41), Oct. 13, 1997, AIU Publ., New Delhi;
- Beri, G.C., (1993), Research and Development in Indian Industry, Concept Publication Co., New Delhi, 128 pp;
- Bhartiya, (2013), Comment on Min. of HRD's address published in Times of India on 15 April, 2013, Source: Readers' opinions: posted on 16 Apr, 2013 Retrieved from:- <http://>

- articles.timesofindia.indiatimes.com/2013-04-15/news/38554849\_1\_academia-raju-skill-development;
- Bhatti, S. S. (1994), 'Universities and Industrial Development Bridging the Gap', University News. Vol. XXXII(14), April 1, 1994, AIU Publ., New Delhi;
- BIRAC, 2013, Biotechnology Industry Research Assistance Council [BIRAC], Brochure and other publications, Retrieved from: <file:///C:/Documents%20and%20Settings/Flatron/Desktop/Industry-Academia%20Interaction-MOU.%20Ver%20Imp..htm>;
- DST (1993), The Technology Policy Statement, prepared by the Department of Science and Technology of Govt. of India, 1993, DST Publ.;
- Forbes, Dr. Nauhsad, (2013), Chairman of Confederation of Indian Industries (CII), National Committee on Higher Education, Extracts from his Address in the 'International Workshop on Industry-Academia Collaboration for Greater National Productivity' organised by Confederation of Indian Industries (CII), held on 15 April, 2013, in New Delhi, News-item written/covered by Abhay Anand, published in The Times of India, Suppl. 'Ascent' p. 1;
- Fowler, D.R., 1984, University-Industry Research Relationships, Research Management, Vol. 21, pp 35-41;
- Francis S (1997), 'Alternative Systems of Higher Education', University News, Vol.35 (48), Dec.1, 1997, AIU Publ., New Delhi;
- Ganapathi, V., 1994, Challenges before Science Parks, The Hindu, Daily, dated 21 April, 1994;
- Gandhe SK (1993), 'Restructuring of Undergraduate Courses of Study', University News, Vol.XXXI (48), Nov.29, 1993, AIU Publ., New Delhi;
- Gandhi Dr. MM, (1997) 'Reform & Development of Higher Education in India -Some Key Issues', Souvenir of 18<sup>th</sup> Annual State Conference of Principals (1997), Aurangabad;
- Gandhi Dr. MM (1998), 'Implications of Unplanned & Unmotivated Growth of Higher Education in India', College Post - ICF Journal, Vol.3 No.1, Seed Publ., New Delhi;
- Gautam Dr. Hari, Chairman UGC (1999), 'Reforms in Higher Education - Need of the Hour'- Convocation Address', University News, Vol.37 (46), Nov.15, 1999, AIU Publ., New Delhi;
- Gosavi SS, Parthasarathi S (1991), 'Making University Education Entrepreneurial', University News, Vol. XXIX(18), May 6, 1991, AIU Publ., New Delhi;
- Govt. of India (1966) Report of the Education (Kothari) Commission (1964-66) : Education and National Development, GOI, New Delhi;
- Govt. of India (1985) Challenge of Education Policy Perspective, New Delhi;
- Govt. of India (1986) National Policy on Education 1986, GOI, New Delhi;
- GOI, (1985-86) "Challenge of Education - A Policy perspective" : during the preparation of the NEP, 1986, this document entitled "Challenge of Education - A Policy perspective" was prepared by the Ministry of Education, Min. of Edn, GOI, Publ.;
- Govt. of India (1989) Towards an Enlightened and Human Society, Report of the Committee for Review of the National Policy on Education 1986, GOI New Delhi;
- Govt. of India (1992) Programme of Action 1992 on National Policy on Education, 1986, revised 1992 (Reprinted by UGC) New Delhi;
- Gugnani HR (1991), 'Collaboration Between Society and Higher Education in India', Vol. XXIX(34), August 26, 1991, AIU Publ., New Delhi;
- HRDG-CSIR, 1993, Outturn of Scientific & Technical Manpower in India, Vols 1-4, Publication and Information Directorate, New Delhi;

- Husain Z, Pathak R D, Tripath & S (1998), 'Technological Response of Indian Industry to Globalization and Liberalization', University News, Vol.36 (7), Feb.16, 1998, AIU Publ., New Delhi;
- Hussein Dr.Abid, (1997), Report on Launching of Employment Oriented Courses, Journal of Higher Education, Vol.20 (1) Spring 1997, UGC Publ., New Delhi;
- ISTE (1913), Role of Industry in Technical Education - Recommendations of ISTE-CIICP National Seminars, ISTE NEWSLETTER, Vol. XIII, No.3, May 1993;
- Jalote, Pankaj, 2013, Challenges in Industry-Academia Collaboration, Dept of CSE, IIT Kanpur, Retrieved from:- <http://www.iiitd.edu.in/~jalote/GenArticles/IndAcadCollab.pdf>;
- Kamath R, Sharma D (1999), 'Industry-University Partnership - A Double Benefit, University News, Vol.37(52), Dec. 7, 1999, AIU Publ., New Delhi;
- Komakula, Suribabu, (2013), Comment on Min MHRD's address published in Times of India on 15 April, 2013, Source: Readers' opinions: posted on 16 Apr, 2013 Retrieved from:- [http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849\\_1\\_academia-raju-skill-development](http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849_1_academia-raju-skill-development);
- Kothari Commission Report, (1964-66), UGC Publ.;
- Malhotra KC (1990), 'Indian Industries in the Nineties', University News, Vol. XXVIII(20), May 14, 1990, AIU Publ., New Delhi;
- Mathur Dr. N.C. (1994), 'Institution-Industry Interaction', Journal of Higher Education, Vol.17(3), UGC Publ., New Delhi;
- Murali, Dr PM, (2013), President - Association of Biotechnology Led Enterprises (ABLE), press-release/interview, Retrieved from: <file:///C:/Documents%20and%20Settings/Flatron/Desktop/Industry-Academia%20Interaction-MOU.%20Ver%20Imp..htm>;
- Murry, R.V., 1993, Partnership in the New Global Economy, Jour Tech. Education, V 16, p 1-5;
- Naik B.M., (2013), Comment on Min MHRD's address published in Times of India on 15 April, 2013, Source: Readers' opinions: posted on 16 Apr, 2013 Retrieved from:- [http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849\\_1\\_academia-raju-skill-development](http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849_1_academia-raju-skill-development);
- Narula M (1992), 'Restructuring of Courses for Development Linkage', University News, Vol. XXX(15), April 13, 1992, AIU Publ., New Delhi;
- Natrajan,R. 1993, Factors promoting Industry-institute symbiosis, Jour Tech Education, V16, p15-25;
- Pallam Raju, (2013a), Dr. M.M. Pallm Raju, Hon'ble HRD Minister, Union of India, (2013), Extracts from his Address in the 'International Workshop on Industry-Academia Collaboration for Greater National Productivity' organised by Confederation of Indian Industries (CII), held on 15 April, 2013, in New Delhi, Source [1] News-item written/covered by Abhay Anand, published in The Times of India, Suppl. 'Ascent' p. 1; [2] From Internet: Press Information Bureau, Govt. of India, Retrieved from :- <http://pib.nic.in/newsite/erelease.aspx?relid=94699>Ministry of HRD : April 15, 2013; # Also Retrieved from :-[http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849\\_1\\_academia-raju-skill-development](http://articles.timesofindia.indiatimes.com/2013-04-15/news/38554849_1_academia-raju-skill-development); # Also from EKALAVYA Online News: April, 2013 by Team Ekalavvya. Retrieved from :-<http://www.ekalavvya.com/key-initiatives-on-industry-academia-collaboration-in-education-announced/>
- Pallam Raju, (2013b) Min. of HRD, GOI, interview with VIREN NAIDU, on Jun 19, 2013 on the Ministry's various initiatives to foster employment and employability, Retrieved from:- <http://epaper.timesofindia.com/Default/Scripting/Articlein.asp?From=Archive&Source>

= Page&Skin=TOINEW&BaseHref=CAP/2013/06/19&PageLabel=41&EntityId =Ar 04100  
& ViewMode=HTML ;

- Powar KB (1994), "Cooperation between Academia and Industry" Journal of Higher Education, Vol.17(3) UGC Publ., New Delhi;
- Purkait B.R. (1992), Milestones in Modern Indian Education, New Central Publ. Calcutta;
- Rajagopal, N.R., Sehgal, Y.P., Das, S.R., and Sushil Kumar, 1994, Scientific and Technical (S&T) manpower in India - an analysis of trends, C.U.R.I.E., Vol. 1, pp 24-35;
- RBI, Bulletins and other releases, notifications 2005-2013;
- RIHEP, (2013), Regional Intel Higher Education programs, Retrieved from:-[file:///C:/Documents %20and%20Settings/Flatron/Desktop/Intel% C 2 %AE%20 education % 20 Initiative, % 20 India %20%20Higher %20 Education % 20 Academic % 20 Forums.htm](file:///C:/Documents%20and%20Settings/Flatron/Desktop/Intel%20C%20AE%20education%20Initiative,%20India%20%20Higher%20Education%20Academic%20Forums.htm);
- Sarma P.K. (1998), Higher Education : A Global Challenge for 21<sup>st</sup> Century, Report of the World Conference on Education India The Next Millennium, Nov. 1998, ISERD, Howrah;
- Shukla P.D. (1990), The New Education Policy in India, Sterling Publ. New Delhi;
- Singh A (1997), 'Challenges of Higher Education', University News, Vol.35(48), Dec.1, 1997, AIU Publ., New Delhi;
- Swaminadhan D (1990), 'A Model for University Industry Symbiosis', University News, Vol. XXVIII(20), May 14, 1990, AIU Publ., New Delhi;
- Swarup, Dr Renu, (2013), Managing Director Biotechnology Industry Research Assistance Council (BIRAC), press-release/interview, Retrieved from: [file:///C:/Documents%20 and%20Settings/Flatron/Desktop/Industry-Academia%20Interaction-MOU.%20Ver%20Imp.. htm](file:///C:/Documents%20and%20Settings/Flatron/Desktop/Industry-Academia%20Interaction-MOU.%20Ver%20Imp..htm);
- Taskar, M., and Packham, D., (1993). Industry and Higher Education: a question of values, Studies in Higher Education, Vol. 18, pp 127-136;
- Thakur, Ashok, (2013), Secretary Higher Education, MHRD, Government of India, Extracts from his Address in the 'International Workshop on Industry-Academia Collaboration for Greater National Productivity' organised by Confederation of Indian Industries (CII), held on 15 April, 2013, in New Delhi, News-item written/covered by Abhay Anand, published in The Times of India, Suppl. 'Ascent' p. 1;
- The HINDU, (2013), Workforce Development Initiative for IT Sector, News-item, written by Abdul Latheef Naha for Online edition of India's National Newspaper-The Hindu, Chennai Edn., Education Plus Suppl. Oct 03, 2005, Retrieved from:- [http://www.hindu.com/ edu/2005/10/03/stories/ 2005100300260900.htm](http://www.hindu.com/edu/2005/10/03/stories/2005100300260900.htm);
- UGC (1986-2012), UGC Annual Reports : 1986-87 to 2011-12, University Grants Commission, New Delhi;
- UGC (2011), Booklet "Inclusive And Qualitative Expansion of Higher Education" : Compilation Based on the Deliberations of the Working Group for Higher Education in the 12th Five-Year Plan (2012-17), UGC Publ. November, 2011, Chapter 1, pp 1-10 and Chapter 4, pp 66-73;
- UKIERI, (2013), Proceedings of the Two day National Workshop on 'Quality Assurance and Accreditation' on 12-13 May 2013, in New Delhi jointly organized by the United Kingdom-India Education and Research Initiative [UKIERI] in partnership with National Board of Accreditation [NBA] and the Ministry of Human Resource Development, Government of India [MHRD]. Retrieved from:- [www.ukieri.org/images/.../Report\\_UKIERIWorkshop-QualityAssurance](http://www.ukieri.org/images/.../Report_UKIERIWorkshop-QualityAssurance);
- UNESCO, (2002), 'Open And Distance Learning Trends, Policy & Strategy Considerations', UNESCO publ, 2002, p 14;

- University of Poona, 1992, Collaboration between Universities, Research Institutions and Industries, UOP Booklet, UOP Press, 15 pp;
- University News, (2013a), Special Issue on Rashtriya Uchchatar Shiksha Abhiyan (RUSA) : National Higher Education Mission, AIU Publ., New Delhi, Vol. I, Chapter 1 : Background, p 19;
- University News, (2013b), Special Issue on Rashtriya Uchchatar Shiksha Abhiyan (RUSA) : National Higher Education Mission, AIU Publ., New Delhi, Vol. I, Chapter 4 : p 92;
- Usha V Sri (1995), 'Academic Audit in Higher Education', Journal of Higher Education, Vol. 18 No.1, UGC New Delhi, pp 41-45;
- Veena Bhalla (1997), Statistical Data on Growth of the Higher Education System in India (1947-1996) (Enclosure to Dr. K B Powar's book on 'Higher Education in India: Retrospect and Prospect), AIU Publ. New Delhi;
- Venkateswaran, s., 1994, A working partnership between University Research Labs., and Industry, C.U.R.I.E., pp 6-12;
- Wikipedia, (2012), Wikipedia the free encyclopedia, Retrieved from :- [http://en.wikipedia.org/wiki/National\\_Assessment\\_and\\_Accreditation\\_Council](http://en.wikipedia.org/wiki/National_Assessment_and_Accreditation_Council);
- Wilson John P.(1999), 'Human Resource Development' Kogan Page Ltd. Publ., London NI 9JN; pp xxiv, pp 3-4;
- Wishart, J. M.; Oades, C. E. & Morris, M. (2007), 'Using Online Role Play to Teach Internet Safety Awareness', Computers and Education 48(3), pp 460-473;
- Wright, C., (2000), Issues in Education and Technology-Policy Guidelines and Strategies, Commonwealth Secretariat, London.

#### WEBSITES ACCESSED

AIU, New Delhi;

Department of Higher Education, Government of Maharashtra;

<http://pib.nic.in/newsite/erelease.aspx?relid=89764>;

<http://www.prsindia.org/billtrack/the-national-accreditation-regulatory-authority-for-higher-educational-institutions-bill-2010-1140/>;

MHRD, Department of Higher Education, India, Viewed 20 June 2012, <http://education.nic.in/sector.asp>; Ministry of Human Resource Development, India, Viewed 20 June 2012, <http://education.nic.in/>;

NAAC, <http://www.naac.gov.in/> # <http://mhrd.gov.in/naac>

University Grants Commission, New Delhi; <http://www.ugc.gov.in/>

Wikipedia, the free encyclopedia, <http://en.wikipedia.org/wiki/>