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The globalisation of the Indian economy: a need for the internationalisation of higher technical education

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ABSTRACT: Due to information, as well as communication, revolutions and the convergent impact of globalisation, the past decade has created a new set of challenges worldwide for higher education in general, and technical education in particular. Technical education provides the human resources for the successful economic growth of any country. India has accepted the policy of globalisation so as to produce a world-class adaptive workforce for the next millennium at a time of ever increasing competition at the national and international levels. As technology always changes at a fast rate, it has a direct impact on a country's economic growth, particularly in this fast growing process of the internationalisation of education. In a country like India, higher education is in deep financial trouble because of ever-increasing needs, escalating costs and a lack of budgetary resources. Several issues in the process of economic globalisation, and the impact of the process on higher technical education in India, are presented and discussed in the article. Also, the authors propose important suggestions on how to develop technical education in the country with possible economic measures included. A brief outline and a structure of the proposed Techno-Economic Forum (TECO) have been elaborated on.

INTRODUCTION

The world economy is in the midst of a profound transformation. Globalisation, liberalisation and privatisation constitute the three core elements of the economic reforms in the newly emerging global economic systems. Historic events, like the end of the cold war, the transformation in Central and Eastern Europe, the disintegration of the Soviet Union and the emergence of a common market in Western Europe are most significant on the international front. These changes have had a profound impact on both international relations and the world economy. The world has accepted the concept of the so-called *global economy* and this drastic transformation directly relates to the technological development. Also, there is a strong correlation between economics and technology that influence the progress of any nation. As a result, all of the countries around the globe, including developing and underdeveloped, have accepted this concept of macroeconomic restructuring.

It is apparent that India is also passing through this historic movement on the economic front. Indian society expects higher education to develop technology, productivity, international competitiveness and economic development. Technical education has a direct impact on industrial growth. It is a basic and essential input for national development and for strengthening industry, economy and the quality of life of the Indian people. Also, investment in technical education makes a vital contribution to economic growth in terms of higher rates of growth of the economy's productivity.

IMPACTS OF GLOBALISATION

The phenomenon of globalisation has been taking place in the world economic system from the second half of the 19th Century. Globalisation is becoming an engine of growth triggered by free trade and the increasing role of the market economy. As per Petrella, the principal characteristics of globalisation are as follows:

- The globalisation of financial markets;
- The internationalisation of corporate strategies, in particular their commitment to competition as a source of wealth creation;
- The diffusion of technical and related research and development (R&D) and knowledge worldwide;
- The transformation of consumption patterns into cultural products with worldwide consumer markets;
- The internationalisation of the regulatory capabilities of national societies into a global, political and economic system;
- The diminished role of national governments in designing the rules for global governance [1].

The liberalisation and globalisation of the economy require highly trained human resources and an upgrading of management talent. Flexibility is also needed in order to survive in a competitive environment.

ECONOMIC GLOBALISATION VERSUS TECHNOLOGY

Globalisation has placed challenges on the human lifestyle and economic development all over the world. As pointed out by Badran, human development will be essential to accelerate science and technology for sustainable development [2]. Technology is the key variable in the economic development of any country. Technological progress and economic development are interdependent. The contrast lies in the different standards of living between highly developed nations, such as the USA, and underdeveloped nations, such as Haiti or Zaire, and is a reflection of the levels of different technologies and the effectiveness and the essential services provided by engineers to society [3].

It is important that an economic strategy addresses how a country can adapt and shape its higher technical education systems to successfully confront this combination of new and old challenges in the context of rising internal and international market forces.

Technology transfer can be considered to be like a double-edged weapon that, if handled wrongly, could result in expensive and unwanted imports that can hurt the economic progress of any developing nation. The increase in economic distance between the developed and developing countries can also be affected by various economic parameters, such as technological development, access of information, participation in the global decision-making process, etc.

LITERATURE SURVEY

A survey of relevant literature on several economic factors and the status of technical education has led to the formulation of several observations and views, which are also supported by other independent studies. Some of the views are as follows:

- For the past decade, South Asia has been among the world's fastest growing regions. The incidence of poverty throughout South Asia has changed little over the past decade. Sustained economic growth is critical to reduce poverty in South Asia. This region's Gross Domestic Product (GDP) growth rate reached 5.4% in 1999, making it the fastest growing developing region for the second consecutive year [4].
- Science, technology and engineering education in the Asia-Pacific region is developing much faster than anywhere in the world, and is primarily due to rapid industrialisation. Japan, China, South Korea, Singapore, Taiwan, Malaysia and Indonesia are experiencing the fastest economic growth. The per capita Gross National Product (GNP) for the middle-income countries was 6.3 times that of the low-income countries in 1982, and 6.5 times in 1993.
- The world income growth is likely to be accompanied by faster growth in world trade and even faster growth in world investment and technology flow. The emergence of East and South East Asia, including China, as the growth centre of the world, gives an expected rise in the income of this regional block by 13.4% per annum by 2005.
- The report in *Global Competitiveness 1996* gave India a rank of 45 among 49 countries, which is a decline from 35th in 1994, to 39th in 1995, and 45th in 1996.
- In considering higher education, every year, almost 100 colleges are opened in India. However, India has only 4.5 technically qualified persons per thousand people as against 111 in Japan, 262 in Sweden and 184 in Canada. As a further contrast, in a country like the USA, two out of ten students go to general education, whereas eight go to professional education.
- It should be mentioned at this point that the share of government (central and state) expenses in total budgetary expenditure increased from 49% in 1950-1951 to 76% in 1986-1987. The share of the non-governmental sector declined remarkably [5].

THE PARADIGM OF INDIAN ECONOMY

Globalisation, as the transition is labelled, is an attempt by India to join the industrialised and free market economies of the world. During the past decade, India has transformed itself from a controlled planned economy to a free market economy, and commenced its tryst with globalisation in July 1991. Several economic reforms have been introduced in India in various sectors, including education. In July 1991, the government initiated a programme of macroeconomic stabilisation. Under trade policy reforms, various steps have been taken to create a globally competitive environment. India is the largest single recipient of World Bank assistance, with cumulative lending of over $53 billion at the end of the 2000 fiscal year [4].

Despite several adverse external factors, the Indian economy has remained relatively unaffected by the regional economic crisis and has performed well, according to Asian Development Outlook (ADO), in an annual publication analysing and forecasting economic trends [6]. It is a well-known fact that higher education faces financial problems all over the world, and India is not immune to this. Education in India is funded by various central and state government sources, as well as by local bodies and private contributions.

HIGHER EDUCATION IN INDIA

The long and auspicious history of education in India has its roots going back to the establishment of the first university in the world some 2,700 years ago, at Takshashila (Taxila), in the northwest part of India [7]. Since then, India has always been at the forefront in education in almost every discipline, including science and technology. The growth and advancement of science and technology education also has its foundations in the ancient period of India with several examples, such as the invention of *zero* and evidence of plastic surgery by the famous *father of surgery*, Shushruta, around 600 BC.

Higher education in India has evolved in divergent and distinct streams with each stream monitored by an apex body, indirectly controlled by the Ministry of Human Resource Development. The state governments mostly fund the universities. However, there are 12 important universities called *central universities*, which are maintained by the Union Government. Because of relatively large funding, they have an economic edge over the others. Engineering colleges and business schools in the country are monitored and accredited by the All India Council for Technical Education (AICTE).

There has been a tremendous expansion of facilities at the higher education stage. At the dawn of independence, the number of universities and colleges of all types stood at 27 and 370 respectively. In 1996-1997, there were 228 universities and 6,759 affiliated colleges. Further, there is one Central Open University (ie Indira Gandhi National Open University - IGNOU) and three open universities in the States, in addition to departments of correspondence courses in different universities. There has also been a sizeable expansion in student enrolment over the last 50 years. The number of students at the university stage, which stood at 0.2 million in 1950-1951 rose to over 6 million by the end of the Eighth Plan.

TECHNICAL EDUCATION IN INDIA

There has been substantial growth in technical education during the post-independence period in India. The number of technical institutions at the first-degree level was 49 in 1950-51. Currently, there are 838 degree-level engineering institutes with

an intake of 232,229 students, as well as 1,224 diploma-level engineering institutes with an intake of 188,300 students, all over India [8]. Also, postgraduate and doctoral programmes in engineering are now available in more than 150 institutions all over the country.

Table 1 shows the regional distribution of the number of approved institutions and student intake for both degree- and diploma-level engineering courses. It clearly shows the regional imbalance, with a greater number of colleges in the south and southwest regions, compared with the other regions.

Table 1: Regional distribution of the technical education infrastructure in India.

Region	Degree-Level		Diploma-Level	
	No. of Inst.	Student Intake	No. of Inst.	Student Intake
Central	81	25,914	98	19,830
East	99	24,019	97	14,099
North	99	26,356	140	17,003
Northwest	119	32,042	150	25,400
South	471	145,372	310	62,311
Southwest	184	58,243	251	11,294
West	154	47,775	178	38,365
Total	1,208	359,721	1,224	188,300

The output of technical graduates increased from a level of 2,893 in 1951 to 59,311 in 1997, and the number of diploma holders rose from 2,626 in 1951 to 91,266 in 1997 [9]. Figure 1 illustrates the increasing outturns in engineering and technology fields in selected professions between 1951 and 1997.

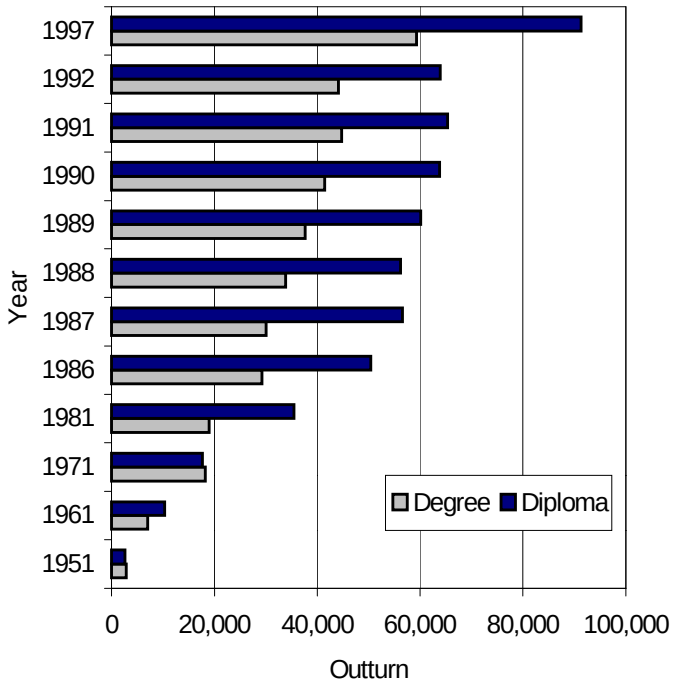

Figure 1: Progress of outturn (selected professional courses) in engineering and technology in India [10].

FINANCING TECHNICAL EDUCATION

Financing higher and technical education is the main problem in most of the developing and underdeveloped countries. Every nation seeks to globalise its local and national standards of engineering and technology education so as to make it competitive in the international market. Table 1 presents public expenditure on education as a % of GNP in selected Asian countries. It can be seen that Japan is doing well, while Bangladesh has the lowest expenditure strategy in education. As the second most populous nation in the world, India has its share of expenditure of 3.8% of GNP in 1994.

Table 1: Expenditure on education of selected Asian countries [11].

Particulars	Population (thousands) (1995)	% World Population	Public expenditure on education as % of GNP (1994)
World	5,687,174	100	4.9
Bangladesh	118,229	2.08	2.3
China	1,220,224	21.46	2.6
India	929,005	16.34	3.8
Pakistan	136,257	2.40	2.7
Sri Lanka	17,928	0.32	3.2
Nepal	21,457	0.38	2.9
Japan	125,068	2.20	4.7

Since 1950, India has adopted a Five-Year Plan as an important development strategy. From 1968 onwards, the goal has been to set apart 6% of national income on education. The total budgetary expenditure on education by the Education Departments of the Centre and States has increased from Rs 644.6 million in 1951-1952 to Rs 300,000 million in 1995-1996. In terms of its share in total budgetary expenditure, it has increased from 7.9% in 1951-1952 to 11.1% in 1995-1996 [12]. The amount of educational expenditure as a percentage of GDP is shown in Figure 2. This has declined from 4.34 in 1990-1991 to 3.91 in 1995-1996.

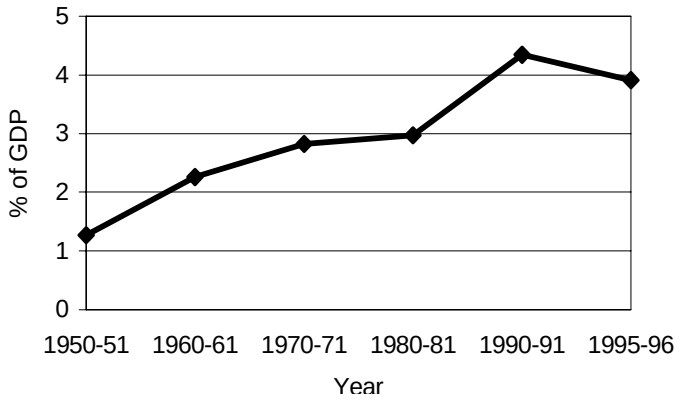

Figure 2: Educational expenditure in India over the last 50 years as a percentage of GDP [13].

About 60 polytechnics offer advanced and post-diploma courses, most of these were initiated during the Eighth Plan under the Technical Education Project, which was assisted by the World Bank. The share of higher education in total planned resources increased from 0.71% in the First Five-Year Plan to 1.24 % in the Fourth Five-Year Plan. However, ever since, it has declined continuously to 0.53% in the Seventh Five-Year Plan and further down to 0.35% in the Eighth Five-Year Plan (1992-97). Nevertheless, actual expenditure has increased by more than 100 times from Rs 140 million in the First Five-Year Plan to Rs 15,000 million in the Eighth Five-Year Plan at current prices, and 6.5 times in terms of real prices [5].

Two important issues that are related with the financing of higher-technical education are:

- Increasing costs;
- Resource generation.

It is very difficult to adequately meet the rising cost of technical education in today's situation of financial recession.

TECHNICAL EDUCATION AND R&D

The progress of any country is always well replicated by the available R&D facilities in that country. Technical labour in India is being developed through a system of publicly and privately financed training and educational institutions. One year after independence, India spent a meagre Rs 11 million on R&D activity in the Central Government sector. Four decades later, the figure grew to more than Rs 30,000 million. In the year 1991-1992, Rs 38,272.3 million was spent on R&D by the Central Government.

Table 2 shows the number of scientists, engineers and technicians engaged in R&D between year 1978 and 1990 in India. It should also be noted that R&D expenditure by industry, as a percentage of total R&D expenditure, stands at only 21% in India, compared to 61% in the UK, 63% in Japan and 72% in the USA. The number of scientists, engineers and technicians engaged in R&D activities is also not satisfactory in India compared to developed nations.

Table 2: Scientists, engineers and technicians engaged in R&D activities between 1978 and 1990 [14].

Year	Scientists, Engineers & Technicians per 1,000 Population	Scientists, Engineers and Technicians Engaged in R&D as per 1,000 Population	Scientists, Engineers and Technicians Engaged in R&D as % of Total Number
1978	2.97	0.10	3.37
1980	2.63	0.10	3.80
1985	3.43	0.13	5.83
1990	3.76	0.15	5.85

STUDENT MOBILITY

Indeed, recent literature research shows that thousands of students from India are enrolled in various higher education institutes all over the globe; however; this mobility takes place in one direction only. For instance, the highest number of foreign students enrolled in various universities of the USA is from India [15]. At the same time, around 150,000 students from the USA are mobilised and enrolled outside in various countries around the globe, yet India is not even in the list of the first 20 countries.

The reasons for this can be listed as follows:

- Scarcity of collaborative projects that are dedicated to the retrieval and dispersal of information in engineering education;
- Lack of proper infrastructure in educational institutions;
- Insufficient levels of advanced facilities and equipment in laboratories and research institutes;
- Shortage of proper and frequent design of curricula for engineering and technology course;
- Lack of uniformity (eg policy, infrastructure, routine administration, etc) and coordination among all universities;
- Higher degree of rigidity in government educational policies with difficulty in implementation;
- No financial support for several advanced projects of R&D due to poor industry linkages;
- Insufficient training opportunities for students after completing their course;
- The need for adequate placement facilities and network for students after graduating.

EDUCATION AS AN ECONOMIC SOURCE

The growth of higher education and the impact of the global economy have influenced the Indian education system over the last few years. Countries like Australia, the UK, Canada and Singapore have already developed *education* as an important source of national income. This has led to the establishment and development of several collaborative projects between universities internationally. For example, approximately 200,000 international students study at Australian universities and these student enrolments contribute over AU$4.2 billion to Australian economy every year [16]. Statistics show that education has been the third most lucrative services export sector in Australia, which is generating over four billion dollars in export income [17]. The literature review also shows that the proportion of international student enrolments at Australian universities has increased from one-quarter to one-third.

The Government of India has already boosted the quality and efficiency of engineering, technical and vocational education through World Bank-supported projects and various collaborative programmes. India has become a global centre for software R&D, along with other disciplines in engineering and technology. For example, at the end of 2002, India announced a programme to improve technical education within the country. The programme includes Rs 15.5 billion from World Bank aid, which will be utilised to upgrade engineering institutes to international standards [18]. This is an extension of various projects announced by the Indian Government to internationalise and standardise engineering and technical education in the country. Under this programme, about 17-20 engineering institutions will be developed as centres of excellence or lead institutions. It is envisaged that these lead institutions will be networked with local institutions for further improvement of technology education in the neighbouring regions of the lead institutions [19].

IMPORTANT SUGGESTIONS

The following are some pertinent suggestions:

- Existing human resource development programmes in India are in a state of fragmentation. An integrated national human resource development system for balanced development in agriculture, industry and the society in general should be promoted.
- The funding of engineering and technology education should be restructured and planned so that it would be suitable for the economic development of India. Moreover, India should adopt the approach of selectivity with regard to globalisation.

- India should endeavour to strengthen the infrastructure and human resources that cover key areas, such as universal literacy, technology advancement and health for all so as to improve the social capabilities of the economy and take advantage of the globally competitive environment.
- Industry, R&D and education should work together to compete globally at the national and international levels. There should also be the introduction of new technologies and their applications, particularly those that result in a high rate of obsolescence.
- The National Education Policy states that … *In the areas of research and development, and education in science and technology, special measures will be taken to establish network arrangements between different institutions in the country to pool their resources and participate in projects of national importance* [20]. With reference to this, international networking should be realised with reputed universities or research centres, such as the UNESCO International Centre for Engineering Education (UICEE), in order to achieve technical development and economic progress.
- With regard to the views and recommendations formulated by the High Power Committee, the important aspect is to encourage greater participation of the private sector in technical education (NB: in pursuance of provision in the Programme of Action, on 24 September, 1992, the Department of Education requested that the AICTE set up a High Power Committee, which held three meetings in 1993) [21].
- The success of economic reform programmes critically depends upon the quality and quantity of the technical workforce. Hence, there is a need to generate more financial resources for the development of technical education.
- India should increase its public expenditure on education to at least above 4% of GNP, with the rest of the expenditure generated through other resources like R&D or industrial investments.
- All possible attempts at raising resources should be carried out as a secondary objective (ie complimentary to the academic culture of the system) by every technical institute and university.
- The higher education sector in India is characterised by massive public investment, although investment is still regarded as much below an optimum level. Such a rapid growth in the public financing of higher education in India has been necessary to advance higher technical education.
- India must formulate a better strategy to market Indian engineering and technology education around the world. In a country like Australia, universities are spending yearly about $250 million to market Australian education abroad [22].

TECO: TECHNOLOGY AND ECONOMIC FORUM

It is a well-known fact that the increased level of globalisation in engineering and technology education has placed governments, as well academic institutions, in a new and challenging situation. In this paper, the authors endeavour to propose a national techno-economic forum, which will help in developing engineering and technology education of the country. It is suggested to establish a *Techno-Economic Forum* in India at the central level, which can be called TECO (Technology-Economics Central Organisation), in order to design and develop proper strategic measures between technology education and economy of the country.

METHODOLOGY

The TECO organisation must be connected with the Asian Development Bank, World Bank, UNESCO, UNIDO and the UICEE. Furthermore, this may form an advisory committee, comprising of one member from each of these international agencies, so as to receive valuable suggestions in building strategies and developing technical education in the country.

The suggested organisation must comprise of two sections, namely: advisory board and administration. The advisory board can be of at least 10 members and six of them must be ex-officio members in the body for a permanent position forming an advisory board. They can be from important governmental organisations, such as those listed below:

- Chairman, All India Council for Technical Education (AICTE);
- Chairman, University Grants Commission (UGC);
- Director General, Council of Scientific and Industrial Research (CSIR);
- Secretary, Ministry of Human Resource Development (MHRD);
- Secretary, Finance Department, Government of India.
- Advisor, Department of Higher and Technical Education, Government of India.

The four members of the advisory board can be filled by nominations and may consist of renowned economists and educators in the country. The detailed administrative and organisational structure is proposed in Figure 3.

CONCLUSIONS

The Indian educational system has a strong mathematical and philosophical base. The number of Indian undergraduate students migrating overseas for higher education is increasing considerably. At the same time, the number of educational institutions is growing all over the country, which, in turn, affects the rate of unemployment and poverty. It is possible to help in alleviating unemployment and poverty in the country by adopting the proper technology, along with a structured economy. With all of these strategic efforts and success, India may be transformed into a world-class economy in the near future.

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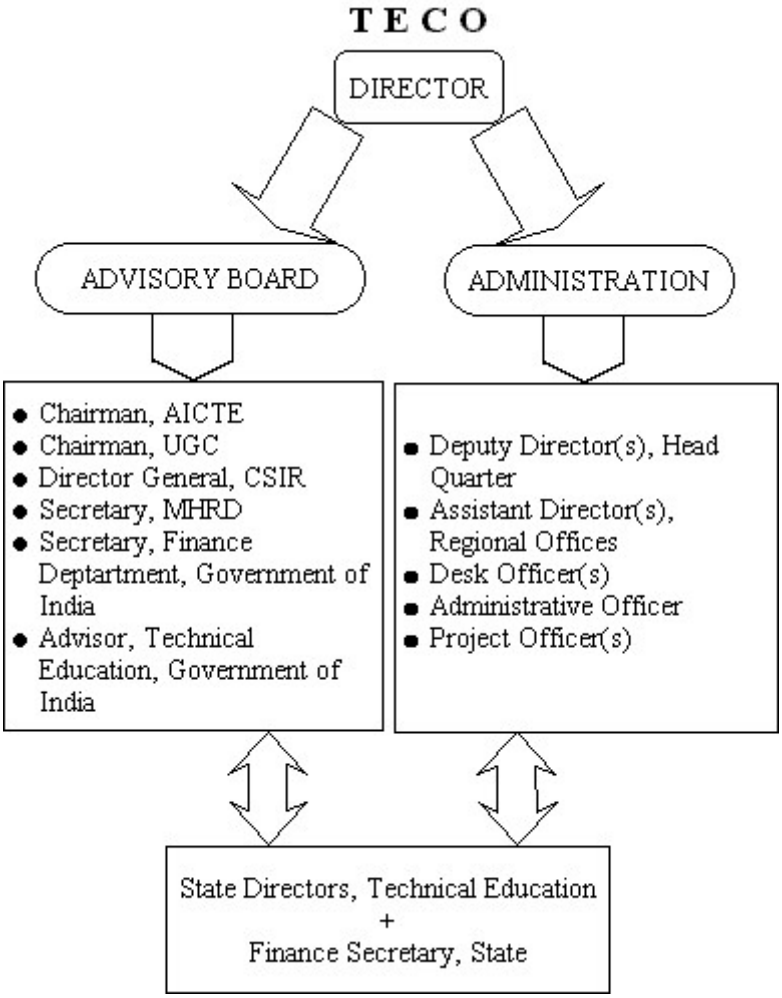

Figure 3: Schematic diagram of the organisational and administrative structure of the TECO.

Abbreviations used:
AICTE: All India Council for Technical Education.
MHRD: Ministry of Human Resource Development.
UGC: University Grants Commission.
CSIR: Council of Scientific and Industrial Research.