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IT EDUCATION AND EMPLOYMENT IN INDIA
EMERGING ISSUES AND CHALLENGES

Parimal H. Vyas*
Nimesh Joshi**

EDUCATION is universally recognized as a central component of human capital. India is currently spending 3.8 per cent of its GDP (1998) on education. A change in education policy came in 1992 towards building an empowered and knowledge society mainly because of LPG and Information Technology (IT) revolution in form of proliferation of use of IT in the field of education largely due to varying initiatives being implemented by the Government of India. The Tenth five year Plan (2002-2007) has estimated the backlog of employment around 34.85 million (Defined on CDS Basis) in the year 2001-02.The sector wise growth of overall employment indicates declining growth rate due to the slower growth in agricultural employment. A task force on employment opportunities that was set up by the Planning Commission for suggesting strategies of employment generation of 100 million people over next 10 years advocated in favour of pursuing suitable policies for education and skill development, that would upgrade the quality of the labour force and make it capable of supporting a growth process which generates high quality jobs. Educational institutions of higher learning have now begun to transact curriculum using varying tools and information technologies but even as on now IT education merely implies computer technology. Earlier IT meant TV or language libraries. The evolution and growth of IT industry has brought bought about a revolution in the education industry as one finds its use and applications in classrooms, libraries, laboratories, museums, shops etc. we find that educators, Universities, coaching centers, software professionals, executive trainers and corporations, both large and small are joining hands to bring the promise of technology-mediated learning to India. But, poor penetration, connectivity, reach, training are few of the big barriers although; interactive content on the Internet is so much better than blackboard and chalk. Indian economy has to therefore now to look for a development strategy, which shall not only revamp these sectors but also brings in comparative advantage for generating additional employment opportunities.

Education Sector in India

The strategy of economic development followed by India from 1951 onwards started undergoing changes from the middle of the 1980s. The Soviet model of central planning of the economy started yielding to market forces. The public sector, which once occupied the commanding heights of the economy, has been brought down in importance. Correspondingly, the importance of the private sector started to increase. The closed economy has gradually started opening up to the outside world. The trend of Liberalisation, Privatisation and Globalisation (LPG) accelerated from the middle of 1991, when India was forced to borrow heavily from the International Monetary Fund and the World Bank following a massive balance of payment crisis that lead to implementation of a Structural Adjustment and Stabilisation Programmes.

* *Professor, Department of Commerce, MS University, Baroda (Gujarat), India.*
** *Faculty Member, SEMCOM, Sardar Patel University, Vallabh Vidyanagar (Gujarat), India.*

Education is universally recognized as a central component of human capital. The role of education as a contributor to the economic growth and its impact on population control, expectancy, infant morality, improving nutritional status and strengthening civil institutions is well organized. The New Education Policy (1986) reflected the priorities of the Congress Party led by Rajiv Gandhi. It gave much attention to Science and Technology in tune with the then Government's agenda of modernisation. A policy change in 1992 came in the wake of a coalition government coming to power. The report of the Review Committee was responsible for the change in the education policy described as "Towards a Human and Enlightened Society" which reflected the change in emphasis referred to as the social tasks. The move from this social task to and building an empowered and knowledge society is on its way of advent. The credit for this shift goes to the Information Technology [IT] revolution.

A brief review of Government spending on the education revealed that India is currently spending 3.8 per cent of GDP (1998). As against the goal of 6 per cent of GDP, the total expenditure on education in India during 2001-02 was 3.99 per cent of GDP (2001-02). An allocation of Rs. 43,825 crore in the 10th Five Year Plan was made against Rs. 24,908.38 crore of the 9th Plan showing an increase of 76 per cent whereas Rs. 28,750 crore has been earmarked for Elementary Education. The total Central Plan allocation has been enhanced by 18.7 per cent from Rs. 5,920 crore in 2001-02 (BE) to Rs. 7,025 crore in 2002-03 (BE) for education. Elementary Education received the highest priority (61 per cent of total provision) with the allocation increasing from Rs. 3,800 crore in 2001-02 to Rs. 4,302.30 crore (excluding Rs. 364.70 crore earmarked for North-East region) in 2002-03 (BE) that is for adult education, Rs. 209.70 crore (Rs. 23.30 crore for North East region) has been provided in 2002-03 (BE) as against Rs. 200 crore made available the previous year. Rs. 2125 crore have been allotted for secondary and Higher Education against Rs. 1920 crore in 2001-02.

Besides, the number of primary schools decreased from 5,42,000 (1999-2000) to 6,38,738 in the year 2000-01. The ratio of upper primary schools to primary school levels was 1:3:2 in 1999-2000 as against 1:3 in 2000-01. Besides, in absolute terms, the number of teachers registered at the elementary level was 3.2 million in 2000-01. The percentage share of female teachers to total teachers was 36.7 per cent in 2000-01. The number of secondary and senior secondary schools increased from 1,16,000 (1999-2000) to 1,21,951 as on September 30, 2002, with a student enrolment of 28.8 million.

In case of technical and professional education, India has 1,203 approved engineering colleges at the degree and 1,195 colleges at the diploma level. She has 1,006 institutes imparting MCA and 930 approved Management Institutes for MBA programs. From the academic year 2001-02, All Council for Technical Education (AICTE) has delegated the powers of approval of Diploma level technical institutes to the State Governments. Strong linkages have been developed between technical institutions and the industry. Out of 600 districts in the country 587 has since been covered under Adult Education Programs. At present 174, districts are in progress under Total Literacy Campaigns, 212 under Post-Literacy Programme and 201 under Continuing Education Programme. About 96.69 million individuals have been made literate as on 31-3-2002 (*Indian Economic Survey 2002-2003*).

Indian IT Sector Profile

IT implies telecommunications involving a combination of Computers, Networks, Satellites, Telephones, Radio, Television and the like which involve Hardware and Software, People, Education, Government and Associations or Collaborative resources. (www.ciet.nic.in/etissues.htm/)

The IT sector is amongst the fastest growing sector of India. To illustrate, the software industry has been growing a Compound Annual Growth Rate (CAGR) exceeding 50 per cent since 1997 and with turnover of US$ 10.25 billion and its Exports was of US $ 7.8 billion in the year 2001-2002. Software Exports have also registered a CAGR of about 60 per cent. The IT Software and Services Industry accounted for about 2 per cent of India's GDP in the year 2000-2001 and 18 per cent of total exports. It

is expected that IT software and services industry will account for 7 per cent of India's GDP and 35 per cent of the total exports by the year 2008.

The Nasscom McKinsey Report, 2002, has reiterated that despite recent slowdown, the ITS and ITES industry is poised to meet its long-term exports potential of US $ 57 billion. The IT enabled services export is likely to reach figures of US $ 21to 24 billion by the year 2008. A large number of Indian software companies have acquired international certification. Out of the top 400 companies, more than 250 have already acquired ISO 9000 Certification. (ITAcT.htm, and www.indianembassy.org/indiainfo/india_ithtm)

Organizational set up for IT Education

A shift in the education policy was largely necessitated because of LPG and IT revolution. The foundation to this IT revolution is proliferation of use of IT in the field of education. One mainly finds three streams of IT education in India viz., Formal University based Courses; Courses offered by Institutions of Higher Learning, and Commercial Training Establishments. Courses conducted by institutions for Advanced Education like the Indian Institute of Science, Indian Statistical Institute and others focuses on academic excellence and research activities. Few like NIIT and APTECH, which operates on franchisee basis, provides short-term, skill-oriented programmes. It is estimated that there are 0.5 million students who are getting trained through this sector. The non-formal sector has over 5,000 training institutions and it is annually growing at the rate of around 20 per cent (Business World, September 2001).

Government Initiatives for the IT Sector

A brief review of initiatives of Government of India in implementation of IT reveals enacting of the *Information Technology Act, 2000* to provide legal framework for facilitating electronic commerce and electronic transaction and recognization of electronic contracts, prevention of computer crimes, electronic filing/documentation, digital signature, etc.

The government department has also set-up *Community Information Centers (CICs)* in North East States and Sikkim for socio- economic development of the region to help in combating escalating crisis in health, energy, water, education and literacy as well as poverty alleviation.

To bridge digital divide; the Government of India has established *'Media Lab Asia'* in collaboration with Media Lab MIT, USA to facilitate the invention, refinement, and deployment of innovations that benefit the masses.

The Indian Government has also planned for setting-up *Bioinformatics parks* in order to encourage Entrepreneurship and improve the competitiveness of the Bio Tech industry.

Nanotechnology is an emerging technology of manipulating matter at the atomic scale, which will make products lighter, stronger, cleaner, less expensive and more precise. The Government has worked out plans also to develop this area in cooperation with leading academic and R&D institutions in India.

An attempt is being made for promoting *Indian language Technology* with *the use* of free multilingual software with support of Indian Language processing tools, human machine interface systems, translation support systems etc.

Indian Computer Emergency Team is being set up to ensure that India's information assets, such as strategic, commercial, financial and Government for providing the necessary protection against counter threats to its resources and stable operations.

Vidya Vahini and Gyan Vahini programmes have been designed to provide connectivity to schools

across the country and setting up of essential IT infrastructure at all the higher learning institutions in the country.

High performance computing as required by a large number of scientific and engineering researchers across the India one Teraflop Computing System PARAM TF is being commissioned on 16 December 2002.

E-Governance in order to improve efficiency, convenience, accessibility and transparency in Government, various IT activities such as development of software application packages, National ID, Citizen Databases, GIS/GPS, Smart card and Digital/Educational Content are taken up on pilot scale basis. *National Informatics Centre* has been established to facilitate improvement in Government services, wider transparency in Government functions and improvement in decentralized planning and management (www.mea.nic.in).

Employment Perspectives in India

The increasing diversification of Indian economy together with acceleration in economic growth has resulted in structural changes in the nature of the job market. Economic reforms viz., abolishing of quantitative restrictions, and SSI reservations, reducing tariffs, labour laws reforms, etc. have aimed at foresting labour-intensive production in India. As per the 55th Round (July 1999 – June 2000) of the Survey on Employment conducted by the NSSO, overall employment grew about 1 per cent per annum during 1993-94 to 1999-2000. Employment in absolute numbers has risen from 303 million in 1983 to 374 million in 1994 (2.04 per cent) and to 397 million in 2000 (0.98 per cent). The labour participation rate declined in 1999-2000 as compared with 1993-1994, which is reflected in a sharp declaration in the growth of the labour force from 2.29 per cent annum in 1987-88 to 1993-94, to 1.03 per cent per annum in the period 1993-94 to 1999-2000. Organized sector employment in 1999-2000 was 28.11 million i.e. about 7 per cent of the total employment of about 397 million. Trends in organized sector employment revealed that employment has been declining entirely due to the slowing down in the employment in the public sector from 1.52 per cent per annum during 1983 to 1984 to a negative growth of (-) 0.03 per cent per annum during 1994-2000. This decline could be attributed to restructuring programmes of the public sector, and the ban on recruitment in many State Departments\ Institutions as part of the economy drive to reduce government expenditure.

The sector wise growth of overall employment indicates that the employment growth rate decelerated due to the slower growth in agricultural employment. Employment in sectors like trade, construction, financial services, transport, storage, and communication has grown faster than the average, and the share of these sectors in total employment has increased. This reflects the structural changes in product markets in the post-reforms period. A number of specifically designed poverty alleviation programmes are in order to encourage self and wage employment. For the year 2001-2002 (BE), an outlay of Rs 9,765 crore has been provided under Plan Provisions as compared to Rs 9,270 crore (BE) made available in 2000-01 to the Ministry of Rural Development for rural development, rural employment and poverty alleviation programmes.

A Task Force On Employment Opportunities which was set up by the Planning Commission under the Chairmanship of Shri M.S.Ahluwalia, Member, Planning Commission in order to examine the existing employment and unemployment situation in India, and to suggest strategies of employment generation for achieving the target of providing employment opportunities to 100 million people over next 10 years i.e. 10 million people per year. It has suggested strategy for employment generation with a focus on intervention in five major areas as follows.

First, accelerating the rate of growth of GDP, with a particular emphasis on sectors likely to ensure the spread of income to the low-income segments of the labour force. Second, pursuing appropriate

sectoral policies on individual sectors, which are particularly important for employment generation. Theses sector level policies must be broadly consistent with the overall objective of accelerating GDP growth. Third, implementing focused special programmes for creating additional employment and enhancing income generation from existing activities aimed at helping vulnerable groups that may not be sufficiently benefited by the moral general growth promoting policies. *Fourth, pursuing suitable policies for education and skill development, which would upgrade the quality of the labour force and make it capable of supporting a growth process which generates high quality jobs*, and fifth**,** ensuring that the policy and legal environment governing the labour market encourages labour absorption, especially in the organized sector.

The Tenth five year Plan (2002-2007) has estimated the backlog of employment around 34.85 million (Defined on CDS Basis) in the year 2001-02. It also estimates of addition to labour force over the Tenth five-year Plan period as 35.29 million person years. The total job opportunities that would be needed during the Tenth Plan will be 70.14 million (34.85+35.29 = 70.14 million). The total employment generated from theses programme-based policy interventions will be of the order of the 19.32 million as shown in Table 1.

Table 1: Programme-Generated Additional Employment During the Tenth Five-Year Plan

S. No.	Development Initiative	Employment Opportunities (Millions)
1.	Agriculture and Allied Activities	3.55
2.	Greening the Country through Agro-Forestry	3.50
3.	Energy Plantation for Biomass Power Generation	2.01
4.	Rural sectors and Small & Medium Industries	7.06
5.	Education and Literacy	1.70
6.	Employment through Information and Communication Technologies	0.70
7.	Health, Family and Child Welfare Services	0.80
	TOTAL	**19.32**

Source: ***Planning Commission, Tenth Five-Year Plan (2002-07); Vol.II, p.157.***

The total employment generation will be to the order of nearly 49 million comprising of 8 per cent growth generated to be 29.67 million and programme generated to be 29.67 million and programme generated to be 19.32 million. As a consequence, the rate of unemployment, which was estimated to be 9.21 million, would decline to 5.67 million per cent by 2006-07(Datt and Sundharam, 2004) as shown in Table 2.

Table 2: Total Employment Generation in the Tenth Five-Year Plan

(in Millions)

Sl. No.	Particulars	2001-02	2006-07	Difference
1.	Labour Force	378.21	413.50	35.29
2.	Employment	343.46	392.35	48.89
3.	No. of Unemployed (1-2)	34.85	21.15	(-) 13.70
4.	Unemployment (In Percentages)	9.21	5.11	

Source: ***Ibid.***

IT and its impact on Employment

The Ministry of IT along with various other State Governments and Government Departments like Ministry of HRD, as well as institutions viz., AICTE, New Delhi, UGC, New Delhi, NIC, MIT, and various industrial associations such as NASSCOM; MAIT; APTECH; NIIT and other organizations called as C-DAC; CEDTI, IIT, Delhi and co-opted members viz., TCS; HOD (PIU) & DIRECTOR (ITPC Division) for the period 2002-2007. The major projections regarding manpower requirements by this study team shown in Table 3.

Table 3: Projections of Manpower Requirements

Software sector alone	**22 lacs**
Hardware sector – Direct – Indirect	 16 lacs 32 lacs
Total Employment Generation	70 lacs

Source: ***Taskforce on HRD & Mckinsey Report.***

The study's man power projections for the supply is shown in Table 4.

Table 4: Projections of Manpower Supply

Colleges Awarding Degrees in Engineering	776 (As on 4.5.2000)
Colleges Awarding MCA	494 (As on 4.5.2000)
Total	1270 (1032 for IT courses)
Total Intake (students)	2,05,153 (1999-2000)
IT Courses Intake	66,214 (32.17 per cent)
+ IITS, IIITS, IISC.	7000* (1200 in IT Courses)
Total IT	73,214

Source: ***Ibid.***

The current supply of IT manpower as per the report is shown in Table 5.

Table 5: Projections of Currenty Supply of Manpower

Availability of post Graduates (including MCA)	2.63 lakhs
Availability of Graduates	7.85 lakhs
IITS, IIITS, IISC	0.12 lakhs
Total Availability (PG, MCA, UG)	10.60 lakhs

Source: ***Ibid.***

A critical review of employment generation implies that there are two components of the employment target of the Tenth five-year Plan growth component based on achieving 8 per cent GDP growth and consequently generating 30 million jobs and the Special Programme component generating 20 million jobs. As number of apprehensions are being made against the GDP growth targets, it is likely that 30 million component may get reduced to the extent of shortfall in GDP growth (Ruddar Datt and K.P.M. sundharam, 2004).

IT and Education: Perspectives and Challenges

It took nearly three decades for the overhead projector to reach the classroom from the national level training institute. Institutions like the UGC, IGNOU, and CIET have begun to transact curriculum on Doordarshan but the educational television programs are mostly of enrichment type and not as per demand of the students. India launched the first project called Computer Literacy And Studies in School (CLASS) in 1984 with the objective of generating computer literacy. The 1992 Program of Action pleaded for more computers and computerization. (Www.ncert.nic.in, 30 /12/03). The first major statement on computers in school education was proposed in the IT Action Plan of the Government of India in July 1998.The few of the recommendations relevant for the school were viz., easy installment bank loans for students, teachers and schools for buying computers; employment of IT to promote distance education; setting up of National Council for developing IT courses for various levels of education; training of teachers, and making computers as well as Internet connections available to all schools by the year 2003. Some of the findings that have assisted in formulating policies and programs in ICT in the context of schooling and school education were viz., computer-based learning leads to better co-operation between students; use of IT makes learning more student centered and encourages group learning. IT has a positive effect on students' achievement in all subjects and has a positive effect on student attitudes towards learning and on self-concept especially when they direct their own learning.

The National Policy on Education, 1986 emphasized on viz., Access, Participation and Attainments as the basic ingredients necessary for universal education. The major challenge being faced in India is location of more than 75 per cent of the three million schools in the rural areas. The rest do not have uniform kind of identity. The majority of the privately managed schools are located in metropolitan cities, capital towns or in large cities. Nearly 30 million children enroll in class I, and about fifty per cent of them of them leave before they reach to class VI. Besides, the credibility of institutions managed and funded by Government has deteriorated over the years. The spectrum for introducing the change, necessitated by IT is far too wide and varied. Teaching, teacher education, schooling and learning in schools are generally rigid and resist changes.

The Sixth All India Educational Survey indicated that there are nearly five million teachers and the cost of training teachers is more than the cost of hard ware and soft ware. Some of the basic requirements in form of an action plan to reap tangible results from use of IT in education are viz., flexible multi-skilled work force; information technology or be left out of market; liberalized and opening of an IT market; increase in employment opportunities for IT literates, and spread of awareness regarding IT education across the country. Although, in case of IT education in schools, the success of a new programme crystallized as CLASS 2000 has emerged prominently with a reasonable proposal that 10,000 schools be chosen to provide computer literacy, and additional 100 schools to become pacesetters popularly known as smart schools. There also exit need for providing proper course- ware, validation and continuous evaluation of learning outcomes with a serious considerations and resultant corrective actions. (www.ciet.nic.in/etissues.htm)

Besides, the high demand of distance learning can affect the quality resulting large supply of mediocre products. Many of the distance learning programs currently the web are merely a tool for acquiring information rather than delivering effective education. Thus, how web based education can be made more effective is still not a completely explored area. Moreover changes being rapid, educational institutions may not have the resources to bring about the change in a fast pace. Designing content and sequence of learning so that the product does not become too difficult for the average learner to comprehend is still a challenge. A major concern area of web-based learning is the lack of personal contact of learner and trainer. Thus, developing instructional software and distance education courses which are truly effective requires a balance of pedagogy and technical expertise; two areas which have not been integrated in the past. To deliver education effectively, it would be appropriate to make use of few IT applications

in education viz., Intelligent Tutorial System (ITS), Computer Aided Learning (CAL) and Computer Based Learning (CBL).

Besides, now Interactive computer based packages that are capable of giving feed back to the learners at various levels of learning is available. The demand for distance education is gradually increasing as people and jobs are becoming more skill -oriented. IT can be used to enhance learning and number of learners in diverse areas of education with information being delivered via cable TV, Internet and computer software. People wanting to gain additional knowledge while on job can have access to the choicest education and institutions which on their part can enroll larger number of student's world wide helping the institutions/ Universities to have an international presence, the benefits being in terms of money and academics (Journal of Institute of Management Technology, July 1999).

The Indian universities should plan for pre-service and in-service training for teachers to make them learn and teach IT as content and instructional tool in effective classroom interaction, storage, retrieval of information and evaluation. At present, IT education merely implies computer technology. Earlier IT meant TV or language libraries. From today's perspective it appears that new IT systems viz; multimedia, telecommunications, video conferencing and the like are becoming more pervasive and providing. These are likely to require new kinds of skills on the part of the students seeking to use them and in turn on the part of teachers to manage these technologies as important components of teaching and learning environment (www. ciet.nic.in/etissues.htm).

Integration of IT In Education for Employment: A Win-Win Strategy: In a nutshell, one can conclude that the evolution and growth of IT industry has brought bought about a revolution in the education industry as one finds them in classrooms, libraries, laboratories and museums. Small kids find online learning so interactive that they start doing them before they start going to school. Concept of paperless libraries, student preparing project reports, presentation notes, kids doing homework on PCs are common today. A whole category of people- educators, Universities, coaching centers, software professionals, executive trainers and corporations, both large and small are joining hands to bring the promise of technology-mediated learning to India. But poor penetration and poorer connectivity are big barriers in the course of the journey and even the attitudes of teachers can be hurdles. This rapidly growing technology could lessen teacher's workload and digitized content can cut out the repetitive portions of their jobs and they can focus on motivating students, explaining concepts and clearing doubts. If there is something that the students do not understand, they can talk to teachers through either voice-over-IP or toll-free numbers.

Creating digitized content is not enough but it is the format through which it is presented is more important. To illustrate, interactivity is the key to effective online content. The student information system (SIS) implemented by classteacher.com provides the parent a window to the child's classroom world (Business World; November 2000).

It means that in near future the use of IT for students would implies no more mindless cramming. Interactive content on the net is so much better than blackboard and chalk. Self-study would become easy with online helpers. Parents would get rid of any more anxiety and freedom from homework deadlines. Teachers will be just e-mail away and no more surprises at the end of the term. Faculties would not be required to dictate notes any more. Digitized content takes away all the drudgery. They will be able to conduct online testing and would be in a position to provide customized feedback to students continuously and be able to make database of all sorts of records. For managers and administrators the use of IT in education would lead to networking and savings of time and quick decisions and prompt feedback to its stakeholders (Source: Ibid)

Concluding Remarks

In a nutshell, it has been estimated that on basis of 8 per cent GDP Growth, the Tenth five year Plan will generate an additional 29.67 million job opportunities but considering business as usual basis and it therefore appears that enough job opportunities will not be created even to take care of the additions to labour force of the order of 35.29 million resultant into requirement of 5.62 million employment opportunities. It means that total number of unemployment will reach to figure of 40.47 million. The Report of Special Group has therefore recommended policy intervention in some of the labour intensive sectors viz., agriculture, food processing, rural non-form activities, including khadi and village industries, small and medium enterprises and service sectors encompassing health, nutrition, education, information technology and communications It is high time that Indian economy looks for a development strategy considering ways and means and possible impacts of IT and revamps those sectors where the comparative advantage is in the favour of a labour intensive production.

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