Workforce Development in India

Policies and Practices

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Shyamal Majumdar

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Preface

India, with a population of more than one billion and a workforce of 500 million, has maintained a remarkable gross domestic product (GDP) growth rate of around 9% during the last four years. The unprecedented economic growth accompanied by widespread urbanization along with foreign direct investment has fueled a demand for skilled workers in India. A severe shortage of skills is apparent in the organized and unorganized sectors of the country's economy.

The task of workforce development in India faces the changing realities of globalization and competitiveness, on one hand, and the need for inclusive growth on the other. The low literacy rate and lack of skill training of the vast majority of the Indian populace poses a major hurdle for its journey towards a knowledge economy. Therefore, policies to ensure higher quality education and the expansion of vocational education and skill training for the poor and underprivileged are needed in order to produce a new generation of educated and skilled employees who are flexible, analytical, and can serve as driving forces for innovation and growth.

India does, however, enjoy the demographic advantage of an increasing young population, in comparison to the aging societies in most advanced countries. Nearly 12 million youth join the workforce every year. In order for India to exploit this demographic advantage in the future, there is a need to create a model to impart vocational education and training that is flexible, sustainable, inclusive, and creative. The challenge therefore facing the country is how to train and equip this young population with ways and means of gaining productive and meaningful employment.

This report focuses on the issues, practices, challenges, and policy directions for workforce development in India, especially, the need to reposition technical and vocational education and training (TVET) for the development of high-quality skilled workers and knowledge workers and at the same time to facilitate the process of encompassing the unorganized and informal sector within its folds.
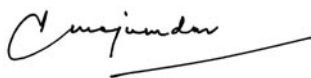
The report begins with an overview of the current labor market conditions in India—acute skill shortages, skill mismatches between demand and supply, low productivity of workers in the informal sector, unemployment and under-

employment and a growing demand for knowledge workers in the emerging fields of the economy. The following sections discuss the education system in India in general and the issues and challenges facing vocational, polytechnic, and engineering and professional education and training systems, in particular. The final section identifies the current priority issues for workforce development that need to be addressed and recommends subsequent policy interventions as cornerstones for action.

The major data sources of the report are government reports and statistics including the Report of the Task Force on Skill Development by the Planning Commission of the Government of India and reports of the Ministry of Labor, development partners' reports, institutional annual reports, and best practices of other countries. Data on the Education System of India and its components were gathered from both internal and external records. Some texts were also adapted from a number of data from previous studies and publications.

Though the report covers mainly general recommendations and policy directions for workforce development, the author hopes that this will contribute to the literature by providing background on the TVET system in India as a whole and its role in developing a skilled workforce for gainful employment.

I would like to convey my sincere appreciation to Dr. Rakha Majumdar for helping me to compile the report and to Ms. Kenneth Barrientos for helping me in editing. My thanks also to Ms. Patricia Decker for editorial and production assistance.

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Abbreviations

ADB	Asian Development Bank
AICTE	All India Council for Technical Education
ATS	Apprenticeship Training Scheme
CTS	Craftsman Training Scheme
DGET	Directorate General of Employment and Training
DOE	Department of Electronics
DOEACC	Department of Electronics Accreditation of Computer Courses
DST	Department of Science and Technology
GATE	Graduate Aptitude Test in Engineering
GDP	gross domestic product
ICT	information and communications technology
IGNOU	Indira Gandhi National Open University
IIM	Indian Institute of Management
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IMC	Institute Managing Committee
INDEST	National Digital Library for Science and Technology
ISTE	Indian Society for Technical Education
IT	information technology
ITC	industrial training center(s)
ITES	information technology enabled services
ITI	industrial training institute(s)

JICA	Japan International Cooperation Agency
JSS	Jan Shikshan Santhan (community education organizations)
KVIC	Khadi and Village Industries Commission
KVK	Krishi Vigyan Kendras (farm science centers)
MES	modular employable skills
MHRD	Ministry of Human Resource Development
MoLE	Ministry of Labour and Employment
NASSCOM	National Association for Software and Services Companies
NCERT	National Council for Educational Research and Training
NCVT	National Council for Vocational Training
NGO	nongovernment organization
NIOS	National Institute of Open Schooling
NIT	National Institute of Technology
NITTTR	National Institute for Technical Teacher Training and Research
NQF	National Qualification Framework
NSSO	National Sample Survey Organization
SCVT	State Council for Vocational Training
TEQIP	Technical Education Quality Improvement Programme
TESDA	Technical Education and Skills Development Authority (Philippines)
TVET	technical and vocational education and training
UGC	University Grants Commission
UNESCO	United Nations Educational, Scientific and Cultural Organization
VET	vocational education and training

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I. EMERGING LABOR MARKETS IN INDIA

A. Background

India is a large country with a population of more than one billion and a workforce of 500 million. In recent years, India has been noted as one of the fastest growing economies of the world, with an unprecedented gross domestic product (GDP) growth rate of 9.2% in 2006–2007. This growth may well be attributable to the new economic policies of liberalization, privatization, and globalization adopted by the government of India at the end of the last century.

The success of Indian graduates in the information and communications technology sector contributed to the visibility of India in the world market. This was supplemented with workers possessing skills at a lower level, as those required in call centers and business processing outsourcing. In addition to the service sector, the health care and retail sectors have noticeably expanded in the last few years.

This growth, however, has limited inputs for solving India's long-standing problems of unemployment, under-employment, and poverty. Rather, the sudden expansion in these sectors has resulted in a skill mismatch between availability and requirement. An appraisal of the current labor market scenario in India reveals a growing shortage of skilled workers and particularly of knowledge workers in the previously mentioned industries and other emerging fields, on one hand, and the existence of an army of educated unemployed on the other, constituting 69% of all unemployed people. According to the National Sample Survey Organization (NSSO, 2004), only 5% of the total labor force in India has any formal training and about 80% of the job seekers registered with the employment exchange lack any professional skill. The current skill level of the workforce has become a major area of concern of the government of India.

The current growth in various sectors, being mainly urban centered, has also failed to incorporate the vast majority of the rural poor and other backward sections of the society. With nearly 70% of the population living in rural areas, India remains a predominantly agricultural society. Though the agricultural sector has seen considerable growth in the five decades since

independence, with substantial increases in agricultural production, the general livelihood of the rural population remains low. A lack of education in general and employable skills in particular, leaves very few options for these people to do anything other than rely on raw labor for their livelihoods resulting in low earnings and subsequent poverty.

However, India enjoys the demographic advantage of an increasing young population, in contrast to the problem of aging societies in most advanced countries. Nearly 12 million youth join the workforce every year. In order for India's system to adjust to the changing context and exploit this demographic advantage, it needs to create a model for imparting vocational education and training that is flexible, sustainable, inclusive and creative. The challenge therefore facing the country is how to train and equip this young population with ways and means of gaining productive and meaningful employment. In acknowledgment of this necessity, the government of India has initiated a National Skill Development Mission to undertake the task of widening the reach of vocational education and training and initiating a paradigm shift in skill development policies to meet the challenges of making people more productive, developing self-employment skills and reducing poverty, and at the same time improving the quality and relevance of technical and vocational education and training. Making vocational education and training the pivot of the national policy is an urgent imperative for sustaining the current economic growth in India.

The effects of globalization, rapid technological changes, and global competition on the Indian economy have been pronounced, and the economic landscape of the country has undergone tremendous changes in the last decade and a half. Today, India needs a dual growth process that will enable it to become a knowledge power and a global service and labor provider, on the one hand, and to have more inclusive processes, on the other hand, in a way that will bring about faster poverty alleviation by generating high quality employment and increased incomes to the poor and underdeveloped. Hence, workforce development requires deep attention from the policymakers of the country and has the potential to be the key to solving India's problem of poverty alleviation and sustainable growth.

B. Socio-Economic Context

The Indian economy is predominantly agriculture based, with 70% of the population living in rural areas. The agricultural sector contributes 30% of GDP and accounts for 10% of exports. Though agricultural production has increased nearly three and a half times over the past five decades, Indian agriculture is still highly traditional and monsoon dependent. Though per

hectare yield has doubled since independence, it has yet to reach the high levels that could be obtained by crop rotation, better land development, and improved irrigation facilities, etc. Small land holdings also limit the use of intensive agricultural production practices using modern techniques. The livelihoods of small farmers and landless laborers, who constitute the majority of the rural population, have remained generally poor.

The current trend of increasing industrialization hints at a possible diversion of agricultural land to other uses such as housing, roads and industry, leading to new complexities between the rural population and industrial forces and causing social resentment and unrest. Agro-based industries such as food processing, food preserving, food packaging, recycling of agricultural wastes, etc., are possible development areas related to agriculture.

After independence from British colonial rule in 1947, the government of India laid stress on large-scale manufacturing. This was due primarily to the expectation that this would lead to rapid industrial development and subsequent economic growth. In the initial Five-Year Plans, employment generation was viewed as part of the process of development and not as an independent goal. These expectations did not materialize and it was observed that the rate of growth of employment was generally much lower than the GDP growth rate (Directorate General of Employment and Training 1999–2000). Successive plans, strategies, policies, and programs were re-designed to bring about a special focus on employment generation for both the rural and urban poor, as special objectives.

The 1970s and 1980s saw the emergence of special schemes to provide wage employment through public works programs and to promote self-employment and entrepreneurship through the provision of assets, skills and other support to the unemployed and the poor. While employment expanded to a certain extent during the seventies and eighties, the rate of growth of employment continued to lag behind that of the labor force. Unemployment among the educated began to rise and continues to do so. The sizeable proportion of employed people working at low levels of productivity and income constitutes another feature of the employment situation in India. The eighties exposed the weakness in the then ongoing strategies of expanding the public sector without regard to competition.

India's economy was heavily protected until 1991. Important production sectors were (and still are to a certain extent) confined to the public sector. For nearly four decades, the infrastructure development and service sectors were mainly kept within the purview of public sector undertakings. The lack of competition in the domestic market and the near absence of export or participation in world trade led to low productivity and quality. The problems

of government investment, low efficiency, resource constraints, absolute absence of profit in the heavy manufacturing sectors and other public sector enterprises led the government, in the nineties, to invite private participation in a number of these industries.

The New Industrial Policy formulated by the government in 1991 contained a number of measures to unshackle the Indian economy from the cobwebs of unnecessary bureaucratic control and to implement major structural changes in view of the transformation taking place in the global economy. Foreign trade and investment were encouraged and market-oriented reforms were introduced to liberalize the economy from the shackles that had bound it for decades. The increase in economic competitiveness beginning in 1991 paved the way for higher growth rates, which gathered momentum by 2003–04.

C. Economic Development Trends

The Indian economy is undergoing a rapid change thanks to the advent of liberalization, privatization, and globalization. The economy has moved to a higher growth plane with GDP growth rates exceeding 8% since 2003–04 (Figure 1).

Figure 1: GDP at Factor Cost–Annual and Five-Year Average Growth
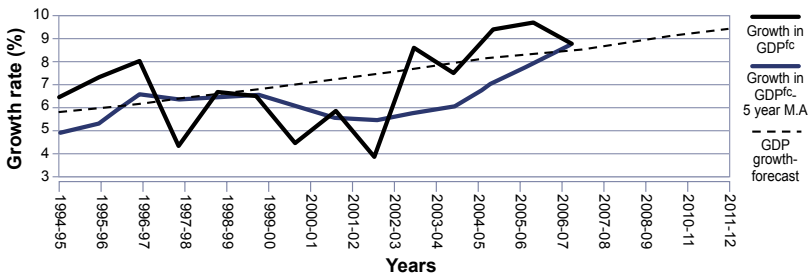
Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

Sectors such as information and communication technology, business process outsourcing, financial services and management information services have steadily contributed to the GDP and are expected to be the major contributors by 2012.

In 2006–07, the performance of the information technology enabled services (ITES) and business process outsourcing industry registered double-digit revenue growth, a steady expansion into newer service lines and an unprecedented rise in investments by multinational corporations. Total

export revenue has grown from US$23.6 billion to 31.3 billion in 2006–07, a growth of 32.6%. Over the last two or three years a number of well-known companies in the electronics/information technology (IT)/telecom hardware manufacturing sector, such as Nokia, Motorola, Foxconn, Samsung, LG, Ericsson, and DELL, have either set up units or are in the process of investing in the country. A majority of the Fortune 500 and Global 2000 corporations are sourcing IT-ITES from India. The total number of professionals employed in the IT-ITES sector grew from an estimated 1,287,000 in May 2005 to 1,621,000 in July 2006. In addition, IT-ITES is estimated to have helped create an additional 6 million jobs through indirect and induced employment in telecom, power, construction, facility management, IT transportation, catering, and other services. Table 1 depicts the growth of production and exports in the electronics industry (amounts noted for July 2006 are estimated amounts; 1 crore = 10 million). According to the NASSCOM-Mckinsey report (2005), India can generate US$60 billion export revenues by 2010 and an additional US$15–20 billion in the next 5–10 years by introducing deep and extensive innovation.

Table 1: Growth of Production and Exports in Electronics Industry

Electronics Production (Rs. Crore)					
Items	2002–03	2003–04	2004–05	2005–06	2006–07[a]
1. Consumer electronics	13,800	15,200	16,800	18,000	20,000
2. Industrial electronics	5,550	6,100	8,300	8,800	10,400
3. Computers	4,250	6,800	8,800	10,800	12,800
4. Comm. & broadcasting equipment	4,800	5,350	4,800	7,000	9,500
5. Strategic electronics	2,500	2,750	3,000	3,200	4,500
6. Components	6,600	7,600	8,800	8,800	8,800
Sub-Total	37,500	43,800	50,500	56,600	66,000
7. Software for exports	46,100	58,240	80,180	104,100	141,800
8. Domestic software	13,400	16,250	21,740	29,600	37,800
Total	97,000	118,290	152,420	190,300	245,600
Electronics Exports (Rs. Crore)					
1. Electronics hardware	5,600	7,700	8,000	9,625	11,500
2. Computer software	46,100	58,240	80,180	104,100	141,800
Total	51,700	65,940	88,180	113,725	153,300

[a] Indicates estimated amounts.
Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

The manufacturing sector experienced a slight decline at the beginning of the century when its growth rate fell from 5.8% in 2001–02 to 3.8% in 2002–03. However, this sector has also performed particularly well in the recent years. According to the latest economic survey, the percentage growth was 8.7% in

2004–05 and 9.11% in 2005–06. Table 2 depicts the drivers of manufacturing growth during April–November 2007.

The service sector has also grown steadily at rates of 9.6%, 9.8%, and 11.2% during the years 2004–05, 2005–06, and 2006–07 respectively. Trade, hotels, transport, and communications witnessed the highest growth (10.9%) in 2004, followed by financial services.

Table 2: Drivers of Manufacturing Growth during April–November 2007

Industrial Item	IP weight adjusted to manufacturing =100	Growth(%) April–Nov. 2007	Contribution to manufacturing growth
Drivers of manufacturing growth during April–November 2007			
Iron & steel group	5.92	16.60	10.02
Insulated cables/wires, telecom cables, etc.	0.83	157.20	8.60
Wood products	3.40	72.60	7.36
Filament yarn, polyester/viscose staple fiber, etc.	3.89	12.40	6.22
Hair oil	0.32	15.10	5.96
Sugar	2.83	57.80	4.80
Syringes	0.51	23.40	4.12
Laminates, PVC pipes & tubes, etc.	2.32	22.10	3.80
Computer systems & peripherals	0.50	36.50	3.50
Rectified spirit, beer, Indian-made foreign liquor	1.16	11.30	3.48
Laboratory & scientific equipments	0.55	43.10	3.24
Adhesive, gelatin	0.21	22.30	2.91
Protection systems/switch board/switch gear, etc.	0.70	8.90	2.85
CR sheets, HR sheets and pipes & tubes	0.43	26.10	2.51
Commercial vehicles, jeeps, passenger cars	0.75	13.90	2.46
Dampeners of manufacturing growth during April–November 2007			
Cine film, X-rays, photo/roll film	0.35	-34.40	-1.20
Ball & roller bearings, gear boxes	0.67	-13.60	-1.20
Telephone instruments	0.78	-22.70	-2.06
Auto, motorcycles, scooters	1.32	-7.80	-2.82

Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

With regard to industry and trade, the index industrial production (which measures the overall industrial growth rate) was 10.01% in October 2004 as compared to 6.2% in October 2003. Tables 3 and 4 illustrate the positive growth in important industries such as chemicals and petrochemicals.

Table 3: Production of Major Chemicals

(Unit: 000'MT, %)

Sector	Production					Annual Growth	
	2002–03	2003–04	2004–05	2005–06	2006–07	2002–03 to 2006–07[a]	2006–07
Alkali chemicals	4,792	5,070	5,272	5,475	5,269	4.0	-3.8
Inorganic chemicals	404	441	508	544	602	10.0	10.7
Organic chemicals	1,353	1,474	1,506	1,545	1,545	5.8	0.0
Pesticides	70	85	94	82	85	0.7	3.7
Dyes & dyestuffs	26	26	28	30	33	5.4	10.0

[a] Indicates estimated amounts. Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

Table 4: Production of Major Petrochemicals

(Unit: 000'MT, %)

Subgroup	Production					Annual Growth	
	2002–03	2003–04	2004–05	2005–06	2006–07	2002–03 to 2006–07[a]	2006–07
Synthetic fibers	1,755	1,868	1,875	1,906	2,250	6.2	18.0
Polymers	4,175	4,499	4,776	4,768	5,183	5.5	8.7
Elastomers	82	87	97	110	101	5.1	-8.2
Synch. Detergent intermediates	447	453	488	556	556	5.5	0.0
Performance plastics	95	99	113	127	132	8.0	3.9

[a] Indicates estimated amounts. Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

Production of the automotive industry grew significantly during the Tenth Five Year Plan, and exports increased to US$2.73 billion in July 2006. Food grains grew at the rate of 6.8% in 2007 compared to the 2.5% in 2006. Overall industrial production and export show rising trends as illustrated in Figures 2 and 3.

Figure 2: Industrial Production

(Unit: rate of change %)
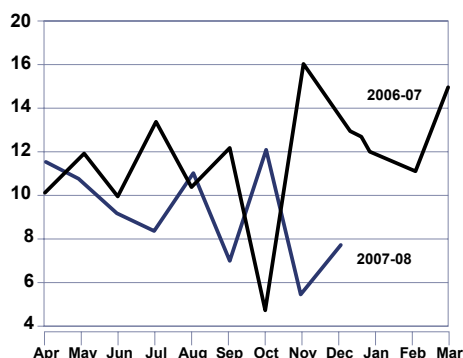
Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

Figure 3: Exports

(Unit: US$ million)

Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.
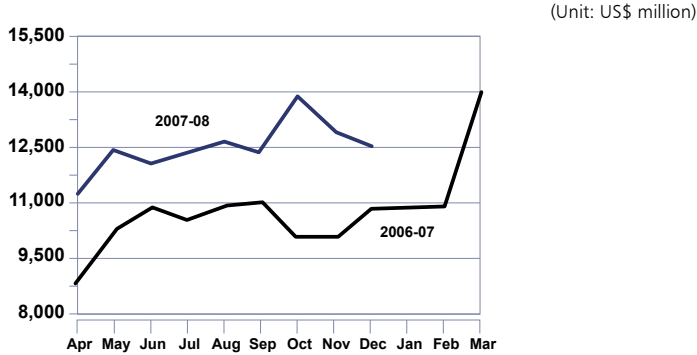
The recent economic growth, the emergence of new trades, and the entrance of more players in the industries, however, led to imbalances in the labor market and brought forth new challenges such as the need to raise labor productivity, improve quality, and ensure that the skills attained by the workforce are useful. Hence, the issue of workforce development has assumed immense importance for sustaining the current economic growth and meeting the current and future challenges of the labor market.

The Labor Market Situation in the Organized Sector

The changes implemented in the economic, fiscal and industrial policies in the nineties brought forth great challenges for Indian industry, calling for re-orientation in terms of production, techniques and practices, technologies, levels of production, testing, quality control and sales and marketing procedures. The subsequent changes adopted in the structure of the economy following the new economic policy of 1991, however, leading to high economic growth, have produced a less significant impact on the sectoral composition of the employed labor force.

Tables 5 and 6 depict the employment and unemployment scenario from 1983 to 2000.

Table 5: Estimates of Population, Labor Force, Employment, and Unemployment

(Unit: million persons, %)

	1983	1988	1994	1999–2000
Estimated population	718.21	790.00	895.05	1,004.10
Labor force	308.64	333.49	391.94	406.05
Employed	302.75	324.29	374.45	397.00
Unemployed	5.89	9.2	7.49	9.05
Unemployment rate (as percentage of labor force)	1.91	2.76	1.96	2.23
Employment in organized sector	24.01	25.71	27.37	28.11
Employment in unorganized sector	278.74	298.58	347.08	368.89
GDP growth	7.7	3.8	5.9	6.4

Source: Directorate General of Employment and Training Annual Report, 1999–2000

The sharp decline in the rate of growth of employment from 2.04% per year in the 1983–94 period to only 0.98% per year in the 1994–2000 period was attributed to the negative growth rate of the public sector which comprised about three-fourths of overall organized sector employment during that time, and to the higher growth rate of the labor force compared to the growth rate of employment by the Directorate General of Employment and Training (DGET). The unemployment rate rose by over 7% by the end of the nineties, raising fears that India was witnessing "jobless growth."

Table 6: Growth of Population, Labor Force, Employment, and Unemployment

(Unit: %)

	Growth rate	1983–94	1994–2000
(i)	Population	2.12	1.93
(ii)	Labor force	2.05	1.03
(iii)	Employment	2.04	0.98
(iv)	Organized sector employment	1.20	0.53
	Public	1.52	-0.03
	Private	0.45	1.87

Notes: Employment, unemployment, unemployment rate and labor force are on usual status basis and are based on estimates given in various rounds of the National Sample Survey Organization. Usual status basis is the accepted method of measuring employment recognizing time utilization only. Quality of work or income is not reflected in this approach.
  – Population estimates are as per projection made by Expert Committee on Population Projection.
  – Organized sector employment is on the basis of data collected by DGE&T.
  – GDP growth rates are from Central Statistical Organisation.
  – The rates of growth of labor force, employment, population, and organized sector employment are compound rates of growth.
Unemployment was reported to be of the order of 27 million during 1999–2000 by the Special Group constituted by the Directorate General of Employment and Training, headed by Dr. S.P. Gupta who adopted the Current Daily Status approach. The number of persons who could have got full employment with the work available in the economy is estimated as employment as per this approach. The difference between labor force and employed gives estimates of unemployment.
Source: Directorate General of Employment and Training Annual Report, 1999–2000

Later surveys indicate that the total labor force in January–June 2004 was 458 million, of which 447 million were employed, and total number of open unemployment was around 10.6 million. Employment in the organized sector[1] was reported to be around 26.4 million and employment in the unorganized sectors around 421.0 million (Working Group on Skill Development and Vocational Training 2006). The organized sector is believed to absorb only around 6% of the total labor force in spite of the growth of various sectors of the economy even in 2004. This trend persisted through the Tenth Five Year Plan, at a time when relatively few jobs were created in the organized sector and employment in this sector grew by only 0.6% annually from 1994–2000 (World Bank 2006). Most jobs created during the period of the Tenth Five Year plan, however, were created in the unorganized sector and this trend is likely to continue in the near future.

Employment in India is changing due to the growth of knowledge based and technologically driven job opportunities. With technology replacing labor, the emerging sectors of the economy are becoming less labor intensive. However, according to a NASSCOM-Mckinsey report, the IT-ITES sector alone will require an additional 1 million or more qualified people in the next five years.

The Labor Market Situation in the Unorganized Sector

The unorganized sector in India employs 93–94% of the labor force (Ministry of Labour, 2006–2007). This is not likely to change in the near future due to the capital-intensive nature of modern industries.

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[1] The DGET considers all establishments employing ten workers or more as being part of the "organized sector" and the "unorganized sector" consists of all private enterprises having fewer than ten total workers, operating on a proprietary or partnership basis. The word "enterprise" refers to an institutional unit in its capacity as a producer of goods and services. An enterprise is classified as proprietary if an individual is its sole owner and as a partnership if there are two or more owners on a partnership basis, with or without formal registration.

In the case of agriculture, the operational holding is treated as an enterprise. The plantation sector is excluded from this definition.

The "informal sector" in India is broadly characterized as consisting of units engaged in the production of goods and services with the primary objective of generating employment and incomes to the persons concerned. These units typically operate at a low level of organization with little or no division between labor and capital as factors of production on a small scale. Labor relations, where they exist, are based mostly on kinship or personal relations rather than contractual arrangements with formal guarantees. The informal sector can therefore be considered as a sub-set of the unorganized sector.

Employment in the unorganized sector grew by 1.1% annually in the 1994–2000 period. During this period, 23.2 million jobs were created, 58% in the service sector and the remaining 42% in secondary sectors. Retail trade alone generated 7.5 million new jobs in the unorganized sector. The other major sectors accounting for the bulk of the new jobs were trade, hotels and restaurants, construction, and manufacturing.

Table 7 depicts the composition of employment in different sectors of the economy and their annual growth rate since 1993–94. The low growth of employment in agriculture is an area of concern of the government, and employment generation programs such as the Swarnjayanti Gram Swarojgar Yojana (SGSY)[2] and Sampoorna Grameen Rozgar Yojana (SGRY)[3] have been initiated to provide employment to the rural population.

The capacity of the organized sector to absorb additional accretion to the labor force is limited, given the current emphasis on modernization and automation. In other words, an overwhelming proportion of the increase in the labor force will have to be adjusted by the unorganized sector. Keeping this situation in view, the Urban Self-Employment Program[4] and Urban Wage Employment Program[5] have also been implemented by the government to alleviate poverty among the urban poor.

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[2] Swarnjayanti Gram Swarojgar Yojana (SGSY), implemented in 1999, is basically a self-employment program. However, the key feature of the SGSY is that instead of promoting individual economic activities, it seeks to promote self-help groups that are trained in specific skills so that they can formulate micro enterprise proposals. The government of India contributes 75% of the funds, while governments at the state levels contribute the rest. NGOs play a major role in the success of these programs.

[3] Sampoorna Grameen Rozgar Yojana (SGRY) is a wage-employment program with the objective of providing additional wage employment with food security in rural areas. Beneficiaries are temporarily employed to build community assets and infrastructures. The central government funds 87.5% of the scheme and the state government provides the remaining 12.5%.

[4] The Urban Self-Employment Programme has two components—one part is for providing assistance to individual urban poor persons for setting up gainful self-employment ventures; the other part is for the development of women and children in urban areas. This program provides special incentives to urban poor women who decide to set up self-employment ventures in a group by taking up any activity that is suited to their skills, training, aptitude, and local conditions (Source: http://cgdif.nic.in/sjsryact.pdf).

[5] The Urban Wage Employment Programme seeks to provide wage employment to beneficiaries living below the poverty line within the jurisdiction of urban local bodies by utilizing their labor for construction of socially and economically useful public assets. More details can be accessed at http://planningcommission.gov.in/plans/planrel/fiveyr/9/vol2/V2c2_2.htm.

Table 7: Composition of Employment by Industry Sector

Sector	Employment share (%)			Gross value added per worker (Rs) 1999–2000	Annual Growth (%) over 1993–94
	1961	1993–94	1999–2000		
Agriculture	75.9	63.8	59.9	12,323	3.2
Mining and quarrying	0.5	0.7	0.6	116,863	7.7
Manufacturing	9.5	11.6	12.2	40,741	5.8
Electricity, gas & water supply	0.1	0.4	0.3	269,323	12.0
Construction	1.5	3.2	4.4	33,334	-0.1
Trade, hotels and restaurants	4.3	7.6	9.4	45,344	4.5
Transport, storage & communication	1.7	2.9	3.7	57,245	3.2
Finance, insurance, real estate & business services	0.3	1.0	1.2	193,247	7.2
Community, social & personal services	6.1	8.8	8.4	45,818	8.2
All sectors	100.0	100.0	100.0	27,722	5.8

Source: World Bank, 2006.

The micro and small enterprise sector has played an important role in the Indian economy. Micro and small enterprises registered continuous growth in the number of enterprises, production, employment, and exports during the 2002–2007 period, as shown in Table 8. The 12.8 million micro and small enterprises in the country, as of 31 March 2007, are estimated to account for about 39% of the gross value of output in the manufacturing sector. These micro and small enterprises provide employment to an estimated 31.2 million people in the rural and urban areas of the country.

Table 8: Performance of Micro and Small Enterprises during 2002–2007

Year	Number of Units (in lakh)			Production (Rs. Crore) (at 2001–02 prices)	Employment (in lakh)	Exports (Rs. crore)
	Registered	Un-registered	Total			
2002–03	16.03	93.46	109.49(4.1)	306,771(8.7)	264.68(4.5)	86,013(20.7)
2003–04	17.12	96.83	113.95(4.1)	336,344(9.6)	275.30(4.4)	97,644(13.5)
2004–05	18.24	100.35	118.59(4.1)	372,938(10.9)	287.55(4.5)	124,417(27.4)
2005–06	19.3	104.12	123.42(4.1)	418,884(12.3)	299.85(4.3)	150,242(20.8)
2006–07[a]	20.32	108.12	128.44(4.1)	471,663(12.6)	312.52(4.2)	N.A.

[a] Indicates estimates based on definitions prior to enactment of MSMED Act, 2006. This act was passed in Parliament in May 2006. New Nomenclature and Classification of MSME was developed, proposed, and accepted.
Note: Figures in parentheses indicate percentage growth over previous year.
Source: Ministry of Finance, Government of India. Union Budget and Economic Survey: http://indiabudget.nic.in.

Self-employed people also constitute a sizeable section of the informal sector. According to the 60th survey of the National Sample Survey Organization (NSSO) in 2004, about 57% of working men and 62% of working women in villages were self employed, whereas in urban areas the figures are just 44% and 45%. Farmers with small land holdings were mostly self-employed as they till their own lands with the help of family members. This contributes to the high rate of self-employed persons in the rural populace. In the urban areas, a majority of the self-employed are small shop owners or local services providers of facilities such as private television channels, Internet, and long distance telephone connections.

In the last decade, India has seen a rapid growth in "cyber kiosks" or "tele kiosks," which provide access to business support services for the underprivileged section of society. These kiosks are often upgraded subscriber trunk dialing booths that are often set up in small street shops. These shops, which number around 300,000, have created more than 600,000 jobs.

Employment in the unorganized and informal sector in India is therefore a checkered matrix ranging from small export-oriented and manufacturing enterprises to owners of cyber kiosks and small farmers in rural areas.

Labor Market Challenges

The previous sections illustrate that India's high output growth rates in recent years have not been matched by corresponding growth in employment. Unemployment and under-employment are still common in the Indian labor market, and 26.1% of the population still lives below the poverty line.

According to 2006 statistics reported by the Working Group on Skill Development, the total number of unemployed is around 10 million. This number may seem small compared to the total population of about 1.2 billion and working population of nearly 500 million. However, the figure of 260 million living below the poverty line shows the real state of affairs in the country. The poor cannot afford to be unemployed, but their earnings from the jobs they do are not sufficient to raise them above the poverty line. The vast majority of workers are illiterate, unskilled, or without formal training, and still depend mainly on raw labor to earn a living, resulting in low productivity and meager earnings. NSSO, in its 61st round of survey (2004), reported that only 5% of the workforce in the 20–24 age group has undergone any formal training, and 22.7% of the workforce has received education up to the primary level only. Approximately 44% of the workforce is illiterate.

Training in the informal sector is mainly provided through traditional apprenticeships, but they have significant weaknesses. These apprenticeships are based on traditional technologies and ideas passed down from previous

generations, and the quality of training is only as good as the skills of the master. The theoretical aspect of learning is weak or absent; only the simplest skills are learned, resulting in the low productivity of semi-skilled laborers.

The government of India has adopted various anti-poverty strategies, generation programs such through different wage employment and self employment schemes. Though the ideas behind these schemes are laudable, implementation has been difficult, and the schemes have not yet contributed significantly towards empowering the poor and underdeveloped in acquiring the skills and means to improve their livelihoods in a sustainable way. The adoption of policies conducive to the creation of an enabling environment, rather than the adoption of loosely targeted subsidies, would be a good way to ensure inclusive and sustainable growth. Hence the task of continuing to raise labor productivity while at the same time generating sufficient jobs for a growing labor force is one of the major challenges facing the Indian labor market today.

In an article titled "Key Indicators of Developing Asian and Pacific Countries," the Asian Development Bank (ADB) noted that the "....challenge of Asia's policymakers is not just one of creating jobs for the unemployed and the new entrants to the workforce but also about improving the productivity and earnings of the available jobs." ADB also noted that the broad range of growth-oriented policies in these countries should be categorized into the two groups of growth promoting policies and human capital policies.

The growth promoting policies of liberalization, export promotion and globalization adopted by the government in the 1990s have started to register through the high GDP growth rates of recent years. However, the issue of human resource development has only recently been emphasized.

The following statistics provide evidence for the lack of identifiable marketable skills among the overwhelming majority of the workforce, not only in rural areas but also in urban areas (DGET 1999–2000).

- Only 19.6% of males and 11.2% of females in urban areas possess marketable skills.
- In rural areas, these numbers are just 10% for males and 6.3% for females.
- About 80% of job-seekers enrolling in employment exchanges lack professional skills.
- Educated youth without professional skills constitute 69% of the total unemployed.

Part of the employment problem, however, emanates from the mismatch between the skill requirements of employers and the skill base of job seekers.

Presently, about 3 million graduates and post-graduates are churned out from the countries' colleges and universities. But a majority of them lack the skills necessary for acquiring jobs in the growing sectors of the economy. The expansion of education, particularly higher education, has created an army of graduates and post-graduates, but shortages of middle-level technicians and supervisory skills persist. This mismatch between demand and supply of skills in the labor market and the perceived shortage and poor quality of trained persons is likely to become an impediment in the path to sustained economic growth in the absence of timely corrective measures.

The opening of the Indian economy since the 1990s and India's entry into the global market requires the easy availability of high quality labor to maintain its global competitiveness. The demand for knowledge workers is increasing day by day with the rapid growth of the IT-ITES sector and other emerging fields. The NASSCOM-McKinsey report 2005 projects that there will be a shortfall of about 500,000 suitable professionals by the end of the decade and in the absence of corrective action, this will continue to grow. The development of adequate professionals and knowledge workers both in quantity and quality is another major challenge facing the Indian labor market as it tries to move towards a knowledge economy.

It is therefore necessary to reorient the educational and training systems towards capacity building and skill development in order to meet the growing requirements of industries and also to provide productive and meaningful employment to the impoverished. Flexibility, in terms of duration of course and curriculum, needs to be introduced into the technical and vocational education and training system to allow a quick and adapt response to the changing needs of the world of work.

The challenges facing the Indian labor market at present may be summarized as follows.

Employment Generation for the Poor and Underdeveloped

It will not be easy to solve India's tenacious poverty across the barriers of illiteracy, ill health and other severe social inequalities. While emphasis should be laid on developing an enabling environment, temporary measures for employment generation for the poor and underdeveloped need to be taken as well.

Making People More Productive

Overall labor productivity in India is far lower than that not only of developed countries but also of countries such as Mexico. It is $5.45 per person per hour in India against $20.51 in Mexico. Over 90% of the Indian labor force is

employed in the informal sector in low productivity jobs. The lack of formal training renders them unable to acquire better paying jobs. Broad-based public participation in the process of economic growth requires the adoption of policies leading to proper training and an enabling environment for the poor and backward sections of society.

Overcoming Problem of Skill Shortage and Skill Mismatch

With only 5% of the youth in the 20–24 year age group having received any formal training it is obvious that India's growing economy faces an acute shortage of skilled labor. The current system of vocational education and training has an annual training capacity of around 3 million, against the 12 million who enter the workforce every year. In addition, the obsolescence of trades and technologies due to rapid technological advances and emerging technology fields is leading to mismatches between the skills acquired in vocational training centers and those required by industry. The low skill levels and general lack of education of the workforce is a hurdle in the path of attaining quality production and adapting to advancing technology and emerging fields.

Policies conducive to providing access to vocational education and training (VET) to all and capacity building as well as making VET more market oriented are required in order to overcome the problem of skill shortage and skill mismatches facing the Indian labor market.

Meeting the Growing Demand for Knowledge Workers

Realizing the development potential of the information and communications technology (ICT) sector, various schemes have been undertaken by the Ministry of Information Technology such as software technology parks, e-commerce and information security, e-governance, and communication and strategic electronics. In addition, large private investments in ICT and ICT enabled services are rapidly raising the requirement of different levels of IT personnel. Other emerging technologies such as biotechnology and food processing are also gaining momentum.

The advent of emerging fields of industry and the increasing sophistication of machinery and equipment is increasing the need for knowledge workers. Necessary reforms in the education system as a whole and technical and vocational education and training (TVET) in particular must be brought about to meet the growing demand for knowledge workers and pave the way towards a knowledge economy in the future.

Skill Development for the Informal Sector

Over 90% of employment in India is in the "informal" sector, with employees working in relatively low productivity jobs. While a majority of the labor force is employed in the informal sector, the current training programs at the central and state levels are quite inadequate for meeting the training needs of the large workforce in the informal sector. Developing opportunities for workers to acquire appropriate skills is therefore important for increasing the productivity of this workforce and is imperative for approaching inclusive growth.

II. THE EDUCATION SYSTEM IN INDIA

A. Overview

The general road map of education in India may be traced as beginning with school education followed by college level or vocational education.

School education comprises twelve years of schooling. It is generally known as the 10+2 system, as the first ten years of school education provide undifferentiated general education for all students, followed by a bifurcation into different academic and vocational streams mostly at the +2 stage.

The first six years of school education are defined as the primary level, followed by upper primary (6 to 8) and secondary (9 and 10). The +2 stage, also known as the higher secondary stage, provides differentiation into various academic and vocational streams and marks the end of school education. In some states, the +2 stage is located in intermediate or degree colleges but is not regarded as a part of tertiary education.

Education is regulated by the Central Ministry of Human Resource Development and managed by the Department of School Education and Literacy and the Department of Higher Education. The governments at the state level have Boards of Secondary and Higher Secondary Education, and students need to qualify in central examinations conducted by these various boards operating in the states and union territories after completion of 10 or 12 years of schooling for certification of the same.

The entry point for institutes offering vocational education and training is generally eight to ten years of schooling. Qualification in the secondary examinations is a pre-requisite for entrance to diploma level colleges such as the polytechnics, and entrance to degree level colleges require qualifying in the higher secondary examination. Competitive entrance examinations are used to select students in engineering and medical colleges and also for post-graduate education in the above two disciplines as well as management studies.

Tertiary education in the general streams of science, arts, commerce or professional streams of engineering, medicine, law (judicial science), etc., is provided by under-graduate colleges affiliated to a university. A degree for graduation or post-graduation in any discipline can be awarded only by

a university with the exceptions of the national institutes such as the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIM).

B. Technical Education

The current technical workforce development system in India is provided by three categories of institutions:

- The Vocational Education and Training System at the certificate level being offered by the Industrial Training Institutes (ITI) and also at the 10+ school level;
- The Technician Education System comprising polytechnics offering diplomas in engineering and technology; and
- The Technical Education System comprising institutions offering degrees and higher qualifications in engineering and technology.

Certificate level programs form the first level of technical education in India. These programs are designed to train craftspeople who can work as skilled workers in industry. This training is generally of two years duration after eight to ten years of schooling and is offered in ITIs. There is also a parallel scheme of vocational education offered in schools after ten years of schooling designed to cover functional areas in the service and infrastructural sectors.

The next level of technical education is the diploma level training offered in polytechnics. These programs are generally of three years duration after ten years of schooling. However, a good number of students enter following 12 years of schooling. Diploma holders have so far functioned only at the supervisory level in industry.

The third level of technical education is the degree level, which is of four years duration after 12 years of schooling. It produces engineers who perform functions such as planning, design, production, and management.

Postgraduate programs leading to masters degrees are also offered by some of the engineering colleges and universities and the IITs. Masters degree programs are of two years duration. Students need to qualify in the Graduate Aptitude Test in Engineering (GATE) examination for entrance into a masters degree programs after completing the undergraduate course. Opportunities for obtaining doctoral degrees are also offered by these institutions.

A few institutions offer evening part-time programs to allow diploma holders to acquire degrees and thereby enhance their educational qualifications. Some institutions offer lateral entry for diploma holders into the second year of their degree programs. In addition, examinations are conducted by a few professional societies, which are equivalent to degrees or diplomas.

Figure 4 depicts the flow path of India's technical education system. As the figure shows, there is no opportunity for lateral entry into polytechnics from the ITIs and though the opportunity exists, few ITI graduates return for higher education to polytechnics due to the long duration of their programs.

Figure 4: Flow Path in Technical and Vocational Education in India

AMIE	=	associate member of Institute of Engineers
EC	=	engineering college
GATE	=	Graduate Aptitude Test in Engineering
ITI	=	Industrial Training Institute
PC	=	professional courses
PGC	=	post–graduate college
PTC	=	part-time courses
SP	=	selection procedure
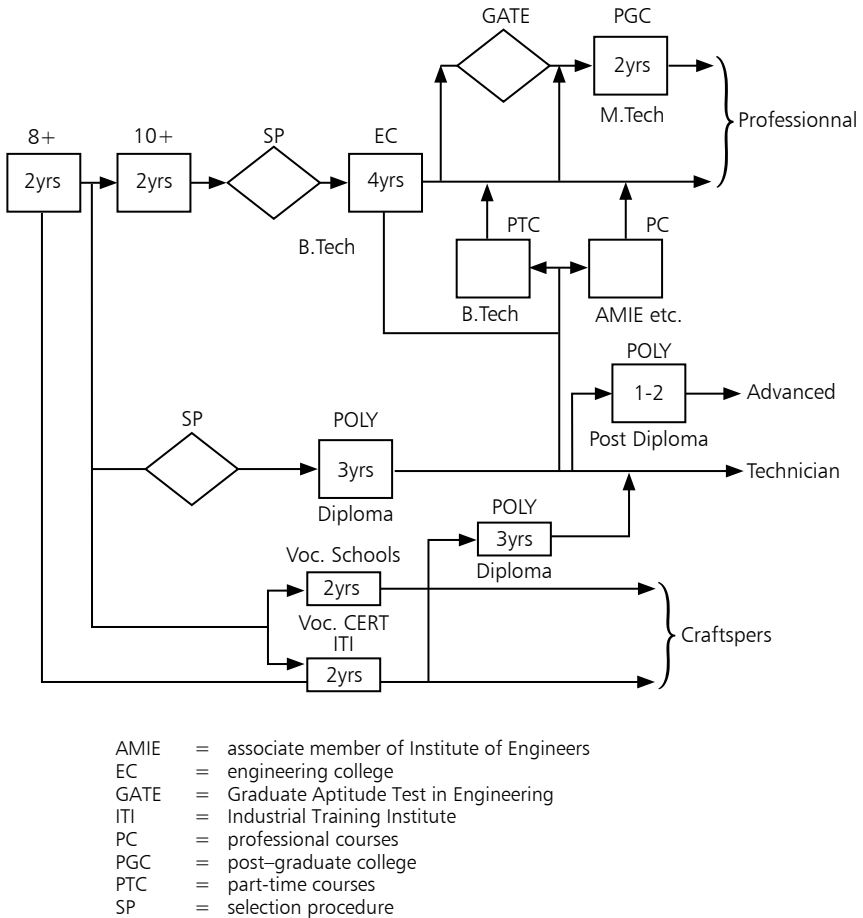
Studies on the job functions of the above categories of technical labor indicate that they need to develop a set of capabilities essential for building excellence in their respective areas of work. The capabilities are given in Table 9.

Table 9: Profile of the Three Categories of Technical Personnel

Engineer scientist/ technologist	Technician engineer and technician	Skilled worker and craftsperson
People in this category, who are involved in research, design and development of new products, technologies and systems, should possess capabilities/skills in the areas of: • Understanding of basic and related engineering sciences; • Engineering design; • Analysis, synthesis, evaluation and problem solving; • Research and development; • Design and development of new products, technologies and systems; • Optimization techniques; • Testing and quality control; • Life-long learning; • Communication; • Management; and • Environmental protection.	This category of people should possess skills in: • Environmental protection; • Understanding of technologies and related practices; • Shop-floor/field planning and management; • Resource optimization; • Supervision of production/ construction processes; • Testing and quality control • Entrepreneurship; • Erection and installation; • Repair, maintenance and Servicing; • Material management; • Environmental protection; • Communication; • Labor management; • Ensuring safety; • Science of improvement and action research skills; • Marketing and sales; • Communication; and • Life-long learning.	This category of technical labor should possess specific job-related skills such as: • Operation and maintenance of machines, plant and equipment for operation and maintenance of machines, plant and equipment for production/ construction as per specifications; • Safe work practices and positive work attitudes; • Environmental protection; • Entrepreneurship; • Productivity; • Improvement; etc.

III. VOCATIONAL EDUCATION AND TRAINING

A. History and Growth

The roots of vocational education and training in India can be traced back to the Vedic Period[6] when students lived in ashrams or *gurukuls* with their guru or teacher and had to perform all sorts of work that was essential for living and learning. In the post Vedic Period, "centers of learning" developed at various places such as Taxila, Varanasi, Sarnath, and Nalanda to impart work-centered education in an institutional setup. Systematic arrangements were made for teaching a number of trades. Eighteen trades were taught in Taxila such as agriculture, animal husbandry, carpentry, weaving, house building, metallurgy, navigation, painting, and sculpture.

Work-related education was given importance in Buddhist culture as well. Buddhist monks living in *viharas* (monasteries) had to learn life skills such as sewing, spinning, knitting, house building, animal husbandry, and agriculture, in addition to religious studies.

Mahatma Gandhi also insisted that training in productive work should be an integral part of general education. In accordance to his ideas, the Wardha National Education Conference in 1937 passed a resolution which stated: "...the process of education throughout the period (7 years) should center around some form of manual and productive work, and all other abilities to be developed or training to be given should, as far as possible, be integrally related to the handicraft chosen, with due regard to the environment of the child."

After independence, the University Education Commission headed by Dr. S. Radhakrishnan recommended a vocational bias in the intermediate courses, while retaining their emphasis on preparation for university education. Later, in 1966, the Education Commission under the chairmanship of Dr. D. S. Kothari,

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[6] In the Vedic period, the entire life of a person was divided into four phases: Brahmacharya (up to the age of 25), Grihastha (age 25–50), Vanaprashtha (age 50–75), and finally Sanyasa. During the period of Brahmacharya, children were sent to the abode of the teachers, *gurukuls*, where they lived as a part of the teacher's family while undertaking his *shiksha* (education and training). Participating in the day-to-day activities with the family was considered as part of the training as the student learned various life skills such as hunting, cooking, sewing, and house building during this process. In addition, the gurus imparted their knowledge regarding economics, religion, governance, warfare, archery, etc., to their students.

envisaged the introduction of the 10+2 pattern of school education so that the +2 stage could be used to divert the large number of school leavers to various vocational education and training courses instead of entering the conventional purely academic courses, in accordance with their need and talent.

The National Policy on Education, formulated in 1968, incorporated these recommendations. Various provisions for vocational education and vocational training have been made since the 1970s under various ministries and have been reformed several times based on the recommendations of the various commissions and committees constituted by the government.

In spite of the above-mentioned initiatives, only 5% of youth in the 20–24 year age group are found to have undergone any sort of formal training. VET in India has not really grown to the expected level for various reasons. It has so far remained supply driven and mostly government funded. Funding has remained limited, and the issue has tended to be crowded out in the budgetary process by other more visible sectors of the economy, such as electricity, water, housing, and roads.

With India's economy growing at a faster pace, increasing the demand for trained and skilled labor, various sectors of the economy are facing acute skill shortages in spite of the existence of an army of educated unemployed. This has raised the necessity of gearing up the VET system and making innovative changes to meet the requirements of the changing world of work. A number of developments on planning and implementation were initiated by the government during the 1990s, with a sharp focus on initial training. Figure 5 depicts the growth of industrial training institutes (ITIs) and industrial training centers (ITCs) since independence.

Figure 5: Growth of ITIs and ITCs from 1956 to 2004
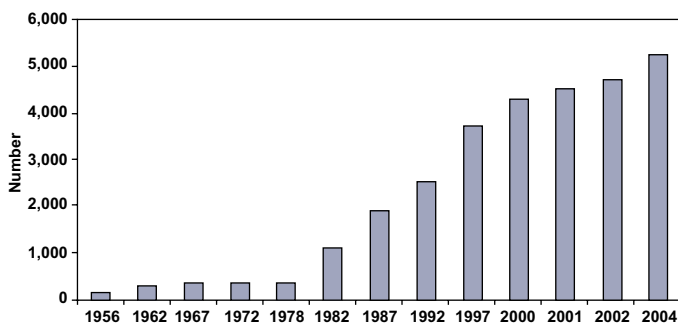
Note: ITC = industrial training center, ITI = industrial training institute
Source: Directorate General of Employment and Training, 2005.

Other schemes and programs for VET are undertaken by various departments and organizations under different ministries. However, in spite of the comparatively fast growth of ITCs during the nineties, India's VET system as

a whole is still wanting in its capacity to meet the increasing demands of the labor market, both qualitatively and quantitatively.

While acute skill shortages continue to plague various emerging sectors of the economy, unemployment and under-employment haunts the backward sections. The ITIs and most other formal training facilities, both public and private, were designed mainly to cater to the needs of the organized sector and fail to encompass the skill requirements of the unorganized and informal sector. As more than 90% of India's labor force is absorbed by the unorganized and informal sector, addressing the issue of skill development has special importance for attaining inclusive growth.

In acknowledgement of the above shortcomings, the National Curriculum Framework 2005 formulated by the National Council of Educational Research and Training (NCERT), proposed the introduction of productive work as a pedagogic medium in the school curriculum (i.e., work-centered education) and advised the creation of a new VET program involving the establishment of separate vocational training centers and institutions from the level of village clusters and blocks to sub-divisional/district towns and metropolitan areas, encouraging public-private partnerships wherever possible.

The importance of VET in workforce development is a priority area of the government, and various policy options for strengthening and repositioning it in the best possible way to meet the current demands and future challenges of the world of work are under consideration.

B. Management of VET

Vocational Education and Training in India is multi-sectoral. Each governmental ministry/department at the central as well as state levels is responsible for workforce development in its own sector. While some offer formal or non-formal[7] courses, others draw from the general pool of educated and trained workers.

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[7] Formal education in India refers to the hierarchically structured education system from kindergarten through university, including institutions of technical and professional education and training. Formal education is highly structured and rigid. Informal education is seen as the unorganized education acquired through interaction with other members of the society. Non-formal education is conceptualized as an organized educational activity, occurring in the traditional framework of the formal education system but flexible in its terms of organization, timing, and duration as well as in its clientele, age group of learners, contents, methodology of instruction, and evaluation procedure. The educational programs are often conducted as part of a broader activity such as self-employment schemes. The flexibility of the non-formal education programs renders them more suitable for reaching out to the otherwise hard-to-reach groups of society in India.

VET has been a concurrent subject of governments at both the central and state levels since the 1976s. The Ministry of Human Resource Development (MHRD) and the Ministry of Labour and Employment (MoLE) are the main central government agencies involved in the funding and management of the VET programs. At the national level, the Directorate General of Employment and Training (DGET) under the Ministry of Labour and Employment is the nodal agency for formulation of trade policies, laying down standards, making grants of affiliation to institutes, monitoring training programs, testing and certification, and other matters connected to the fields of vocational education and training and providing employment services. However, the day-to-day administration rests with the respective state governments and union territory administrations.

The national government is advised by two tripartite bodies, the National Council for Vocational Training (NCVT) and Central Apprenticeship Council,[8] for the purpose of laying down the policies and training standards, trade testing and certification. The introduction of new trades and deletion of obsolete trades are also done with the recommendation of these councils.

State Councils for Vocational Training (SCVTs) have been constituted at the state levels by the respective governments.

The major functions of the NCVT are:

- Recognize training institutions run by government or by private agencies for purposes of the granting of National Trade Certificates and lay down conditions for such recognition;
- Establish and award National Trade Certificates in engineering and non-engineering trades and such other trades as may be brought within its scope by the government of India;
- Prescribe standards in respect of syllabi, equipment, and scale of accommodation, duration of courses and methods of training;
- Arrange trade tests in various trade courses and lay down standards of proficiency required for passing the examination leading to the award of the National Trade Certificate;
- Arrange for ad-hoc or periodical inspections of training institutions in the country to ensure that the standards prescribed by the council are being followed;
- Co-opt, if necessary, any person or persons to advise the council in connection with its work;

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8   These bodies are comprised of members pertaining to various departments and agencies connected to the Ministries of Labour and Employment, Human Resource Development, and the Small Scale Industry.

- Prescribe qualifications for the technical staff of training institutions; and
- Prescribe the standards and conditions of eligibility for the award of National Trade Certificates.

The All India Trade Test for trade apprentices is given by the National Council of Vocational Training (NCVT) twice a year and a National Apprenticeship Certificate is awarded to those who pass. This certificate is recognized for employment under government/semi-government departments/organizations.

In addition to MHRD and MoLE, various VET programs and schemes are carried out under other central ministries as well as the state governments and union territory governments. Presently there are 17 ministries involved in such activities at various levels.

C. Various VET Programs/Schemes

Vocational education and training in India can be broadly categorized into vocational education, vocational training, apprenticeship training, tertiary education and training and continuing vocational educational and training.

The main providers of VET in the country are some higher secondary schools, VET institutions, ITIs/ITCs, community polytechnics, Jan Shikshan Sansthans, National Institute of Open Schooling (NIOS), and the Indira Gandhi National Open University (IGNOU).

A number of other programs, schemes, and courses for vocational education and training, as cited by the All India Consultation Meeting on Vocational Education and Training (2007), are offered by 17 different ministries at the central and state levels. Some of the important schemes and programs of vocational education and training currently carried out by the various ministries are summarized below.

Table 10: Status of Major Vocational Education and Training Programs in India

Sl No.	Name of ministry	Name of scheme/ program	No. of institutions	Annual training capacity	Ref. year	Nos. trained so far
1	Department of Secondary and Higher Education, Ministry of Human Resource Development (MHRD)	Centrally Supported Schemes on Vocation Education at +2 stages	6,800	*5.00	2005–06	*85.00
		Career Oriented Scheme of UGC	NA	NA	NA	NA
		Diploma Programmes of Polytechnics	NA	*2.20	2004–05	NA
		Scheme of Community Polytechnic	675	*4.50	2005–06	*25.00
		Open VEP of National Institute of Open Schooling	853 AVCs	*0.20	2004–05	*0.50
		Open VEP of Indira Gandhi National Open University	NA	NA	NA	NA
		VEP of Community Colleges of India	95	*0.20	2003–04	*1.50
		VEP of Jan Sikshan Sansthans	157	*3.50	2004–05	*15.00
		Arts & Crafts	NA	*2.20	2004–05	NA
	Department of Women and Child Labour, MHRD	Support to Training & Employment Programmes for Women	NA	*0.10	2004–05	NA
2	Ministry of Agriculture	Krishi Vigyan Kendra	492	*1.00	2004–05	NA
3	Ministry of Labour	i) VTP at Industrial Training Institutes	5,253	*7.38	2005–06	NA
		ii) ATS at Industrial Establishments	NA	*2.27	2004–05	NA
4	Ministry of Industry	VTP of KVIC	51	NA	NA	NA
		STP of District Industries Centre	593	NA	2001–02	NA
5	Ministry of Rural Development	Swarnajayanti Gram Swarozgar Yojna (SGSY)	NA	*2.14	2004–05	NA
6	Ministry of Urban Employment and Poverty Alleviation	Swarna Jayanti Shahari Rojgar Yojana (SJSRY) Swarozgar Yojna (SGSY)	NA	*2.00	2004–05	NA
7	Ministry of Information Technology	Diploma Courses in Information Technology	NA	*0.35	2004–05	NA
8	Ministry of Tourism	Hotel Management	NA	*0.024	2004–05	NA
		TOTAL	NA	*33.064	NA	NA

Data collected and compiled from various sources: NA=Not Available; VEP=Vocational Education Programme; Vocational Training Programme=VTP; STP=Skill Training Programme; ATS=Apprenticeship Training Scheme; Accredited Vocational Centers; KVIC=Khadi and Village Industries Commission; UGC=University Grants Commission.

Table 11: Status of Training Programs under Ministry of Small Scale and Agro and Rural Industries

Sl No.	Name of programs	2003–04		2004–05		2005–06	
		No. of programs	No. of trainees	No. of programs	No. of trainees	No. of programs	No. of trainees
1	EDP	276	8,130	591	16,466	826	21,000
2	MDP	148	3,874	269	7,291	372	8,699
3	SDP	215	4,050	250	5,100	510	16,200

EDP=Entrepreneurship Development Programme; MDP=Management Development Programme; SDP=Skill Development Programme.
Source: Ministry of Small Scale Industries and Agro and Rural Industries.

Detailed information on these programs conducted by each of the given ministries is described below.

Ministry of Human Resource Development

Centrally Sponsored Scheme on Vocationalization of Education

This scheme was introduced in 1988 with the aim to provide financial assistance to the Vocational Education Programme for students completing ten years of school education. The All India Council for Vocational Education, under MHRD, is responsible for planning, guiding, and coordinating the program at the national level. State Councils for Vocational Education perform similar functions at the state level.

The national pattern of vocational curriculum at the +2 stage of schooling is comprised of 15% language(s), 15% general foundation course, 70% vocational subjects and an on-the-job training course of four weeks. The general foundation course incorporates entrepreneurship development, rural development, environment education, information and communication technology, and health.

Some 6,800 schools have been incorporated into this scheme so far, providing an annual training capacity of 0.5 million. The Pandit Sunderlal Sharma Central Institute for Vocational Education, responsible for developing the courses for vocational education, has listed 104 courses, and course material for a quarter of those has been prepared as of this writing.

Career Oriented Program at First Degree Level

The University Grants Commission (UGC) introduced the Career-Oriented Programme at the first-degree level in universities and colleges in 1994–95. Under the scheme, vocational electives are offered as add-on courses along with the courses for conventional degree of Bachelor of Arts, Science and Commerce (B.A., B.Sc., and B.Com., respectively). On completion of the course, the students are given a certificate, diploma, or advanced diploma in addition to the conventional degree in arts, science, or commerce.

The Certificate Course is 30 credits. The Diploma Course is 60 credits (30 credits earned during the Certificate Course) and the Advanced Diploma Course is 90 credits (60 credits earned together during the Certificate and Diploma Courses).

Scheme of Jan Shikshan Sansthans

The scheme run by Jan Shikshan Sansthan (JSS) or Institute of People's Education, is a multifaceted adult education program aimed at improving the vocational skill and quality of life of workers and their family members. Its objective is to promote educational, vocational, and occupational development for socio-economically backward and educationally disadvantaged groups of urban and rural population, particularly illiterates and semi-literates, persons belonging to backward groups such as scheduled castes and tribes, women and girls, slum dwellers, and migrant workers. Jan Shikshan Sansthans are mostly managed by registered nongovernment organizations (NGOs) under Boards of Management that include a government representative. They are financed by the Adult Education Directorate within MHRD, but have functional autonomy.

At present, there are 157 JSSs in the country, which run a number of vocational programs of varying durations. About 1.5 million persons have benefited from the vocational education and training programs and other activities organized by the JSS. About 250 vocational courses, ranging from five days to six months (two hours of training per day) are being organized by JSSs which vary both in contents and duration, categorized as computer and information technology, electronics, electrical, mechanical, automobile, refrigeration and air conditioning, health and paramedical, printing technology, cutting, tailoring, dress making and designing, knitting and embroidery, beauty culture and health care, cottage industry course, handicrafts, art, drawing and painting, cookery, bakery, confectionery and food processing, textile technology, teacher training, secretarial practice, agriculture and allied technology, carpentry and furniture making, leather technology, and building technology.

Community Polytechnics Scheme

The scheme of Community Polytechnics was introduced in 1978 with the objectives of ascertaining the felt needs of the community through social and job potential surveys and generating awareness regarding development programs for creating a problem-solving environment within a community. These polytechnics were intended to become the focal point for technology transfer and centers for training youth, women, and other disadvantaged groups in employable skills and to provide technical and other support services for improving local capabilities.

The community polytechnics were established as entities within a regular polytechnic. They work through a main center in a polytechnic connected to one center in any nearby urban slum and four extension centers in village clusters, each covering 10–12 villages. It is intended to work as a training-production center and offer solutions to the technical problems of the local community.

There are 675 community polytechnics at present, training about 450,000 people a year. Emphasis is given on skill training through a variety of short courses, involving 80% practical training and 20% theory. The beneficiaries of the community polytechnics schemes include school dropouts, women, and people belonging to scheduled castes and tribes, OBCs, and other minority groups. There is no equivalence with the formal systems. However, community polytechnic trainees can appear in the examination organized by NIOS to get equivalence.

For the end-of-term assessment, each trainee is given a job to perform integrating all enabling competencies to be achieved. The assessment is done by an expert team, and the competency profile of the trainee is listed on the back of the certificate. The team of experts is constituted of persons from industry, polytechnics, and ITI and the expert trainer. The certificate is jointly issued by the principal of the community polytechnic and representatives of industry and user groups. Certificates issued by these polytechnics are recognized by those industries and user groups. Banks also recognize the six-month duration certificate for providing loans. However, participants in community polytechnics courses gain no special qualification and no particular credit toward further training in ITIs or general polytechnic courses.

Community College Programme

The Community College Programme was launched in 1995, with the opening of the Pondicherry University Community College. The community colleges offer diploma courses in health assistance and nursing assistance, pre-

primary teacher training, desktop publishing operation, computer application, fashion designing and garment manufacture, house electrical and electrical work, air-conditioning and refrigeration, four-wheeler and automobile mechanism, catering, plumbing technology, tailoring and embroidery, tally accounting, medical lab technology, computer hardware, sales and marketing management, travel management, bakery and confectionery, cargo management, printing technology, hotel management, rural marketing, community enterprises, information technology, business accountancy, chartered accountancy, house keeping, etc.

Today, there are 153 community colleges across 17 states with an annual training capacity of 20,000.

Ministry of Labour and Employment

Craftsmen Training Scheme

The Craftsman Training Scheme (CTS) was introduced in 1950 with the objective to prepare semi-skilled and skilled workers for industry by providing systematic training to school leavers and youth in Industrial Training Institutes. Starting from 54 institutions in 1953, the number of ITIs and ITCs has grown to over 5,000 in 2004 with an annual training capacity of 750,000 and training courses are offered in 92 trades currently.

The 3,358 ITIs under the public sector are financed and managed by the state labor ministries, while the 1,895 ITCs are owned, financed and managed by private organizations or NGOs. While the state governments have no direct control over the functioning of the ITCs, they are accredited either to the NCVT or a SCVT.

Over 46,000 seats are exclusively created for women in the ITIs. Reservations for scheduled castes and tribes, disabled persons, OBCs, former servicemen, etc., have also been made following government directives received from time to time. Table 10 shows the number of ITIs and ITCs in the different states and the union territories of India with their seating capacities.

The ITI/ITC courses are mainly designed to serve the organized sector of the Indian labor market. The courses last from six months to three years depending on the trade. Most of the courses in non-engineering trades are one year in length, but enroll fewer than 20% of the students. Entry qualifications for different courses vary from eight to ten years of schooling. Students having academic qualifications of 12 years of schooling sometimes seek admission to these courses as well.

Table 12: Number and Training Capacity of ITIs and ITCs in Various States and Union Territories of India

States	Number of Institutions			Total Capacity			Population (millions)	Capacity per million population			Ratio of private to public	
	ITIs	ITCs	Total	ITIs	ITCs	Total		ITIs	ITCs	Total	Institutes	Seats
States with Dominant Private Sector												
Andhra Pradesh	92	476	568	24,239	87,346	111,585	76	320	1,153	1,474	5.2	3.6
Tamil Nadu	71	605	676	24,812	62,191	87,003	62	399	1,001	14,001	8.5	2.5
Kerala	82	467	549	16,176	43,945	60,121	32	508	1,380	1,888	5.7	2.7
Karnataka	131	610	741	21,340	38,576	59,916	53	405	732	1,136	4.7	1.8
Orissa	27	147	174	7,328	16,660	23,988	37	200	454	654	5.4	2.3
States with Dominant Public Sector												
Maharashtra	347	267	614	67,390	29,794	97,184	97	697	308	1,004	0.8	0.4
Gujarat	135	129	264	70,500	16,626	87,126	51	1,393	329	1,722	1.0	0.2
Uttar Pradesh	185	128	313	38,644	13,284	51,928	166	233	80	313	0.7	0.3
Madhya Pradesh	136	33	169	19,538	2,860	22,398	60	324	47	371	0.2	0.1
Punjab	110	71	181	14,351	4,716	19,067	24	591	194	785	0.6	0.3
Bihar	29	29	58	10,496	4,472	14,968	83	127	54	181	1.0	0.4
Haryana	81	25	106	13,477	1,428	14,905	21	639	68	707	0.3	0.1
Chhattisgarh	80	57	137	8,984	5,880	14,864	21	432	283	715	0.7	0.7
Rajasthan	91	45	136	9,472	3,868	13,340	57	168	68	236	0.5	0.4
West Bengal	49	18	67	11,956	964	12,920	80	149	12	161	0.4	0.1
Delhi	14	48	62	6,088	1,592	7,680	14	442	116	557	3.4	0.3
Uttaranchal	57	16	73	6,088	1,592	7,680	9	718	188	906	0.3	0.3
Himachal Pradesh	55	8	63	5,649	980	6,629	6	930	161	1,091	0.1	0.2
Jharkhand	14	22	36	2,564	3,124	5,688	27	95	116	211	1.6	1.2
Assam	24	3	27	4,536	84	4,620	27	170	3	173	0.1	0.0
Jammu & Kashmir	38	0	38	4,332	0	4,332	10	430	0	430	0.0	0.0
Goa	11	4	15	2,652	420	3,072	1	1,973	313	2,286	0.4	0.2
Combined Other States	23	142	165	2,784	320	3,104	12	225	26	250	6.2	0.1
Combined Union Territories	13	8	21	3,316	664	3,980	3	1,242	249	1,491	0.6	0.2
Total All India	1,895	3,358	5,253	396,712	341,386	738,098	1,027	386	332	719	1.8	0.9

Note: ITC = industrial training center; ITI = industrial training institute   Source: World Bank, 2006.

The trades in which courses are offered at ITIs include fitter, turner, machinist, welder, computer, electrician, electronics, mechanic, tractor, dress making, cook, hair and skin care, and preservation of food and vegetables. Students are required to pass the All India Trade Tests conducted by the DGET, Ministry of Labour and Employment under the aegis of the National Council for Vocational Training to acquire a National Trade Certificate, which is a recognized qualification for recruitment to relevant posts and services in central and state government establishments.

Four Model Industrial Training Institutes have been established under DGET, with 361 trainees undergoing training during 2005–06. The Central Staff Training and Research Institute, Kolkata, is the nodal institute responsible for the development of training standards (curricula) for various trade areas. The institute also offers training programs for trainers and junior and senior level management personnel engaged in planning, execution, and evaluation of vocational training program for various organizations. In addition, it undertakes research and development in the field of vocational training.

Apprenticeship Training Scheme

The Apprenticeship Training Scheme (ATS) was introduced in industrial establishments through the Apprentices Act, 1961. DGET, which is responsible for the implementation of the scheme in government undertakings and departments, acts through six Regional Directorates of Apprenticeship Training.

Employers both in the public and private sector are obliged to have a requisite training infrastructure as laid down in the Act, when engaging apprentices. There are four types of apprentices, of which three falls under the purview of MHRD and one under DGET. The three categories of apprenticeships under the MHRD are graduate, technician and technician (vocational). Eligibility for the three categories is as follows: engineers with degrees for the first, engineers with diplomas for the second, and vocational education graduates for the third. The minimum entry qualification for the fourth category of apprenticeship under DGET varies from eight to 12 years of schooling or a person who has acquired the National Trade Certificate. The period of training varies from six months to four years depending upon the trade and level.

According to the DGET report of 1999–2000, there are 254 groups of industries covered under the Apprentices Act and about 253,541 seats available in 20,700 establishments. The number of registered apprentices in 2001 has been reported to be 158,000. Trade apprentices are given stipends

shared equally between the employer and the central government. The rates of the stipends are revised every two years based on the consumer price index. Details of the Apprentice Training Scheme and the designated trades in which apprenticeships are available are given in Appendix III.

Crafts Instructor Training

Crafts instructor training for potential and existing instructors of training institutes, with an annual intake capacity of 1,099, is offered in 27 trades at five advanced training institutes and one central instructor training institute at Chennai. The objective of the training course is to train instructors in the techniques of imparting industrial skills to skilled workers, who in turn can train semiskilled and other skilled workers for the world of work.

Training for Women

Training is also provided to women in 11 exclusive training institutes for women (one National Vocational Training Institute and ten Regional Vocational Training Institutes).

Schemes for Persons with Disabilities

The Ministry of Labour has established 17 Vocational Training Centers to train disabled persons in various trades. These centers are located in Agartala, Ahmedabad, Bhubaneshwar, Bangalore, Chennai, Delhi, Guwahati, Hyderabad, Jabalpur, Jaipur, Kanpur, Kolkata, Ludhiana, Mumbai, Patna, Thiruvananthapuram, and Vadodara. The Vadodara Centre is exclusively for handicapped women. All these centers follow the procedure of identifying the strength or potential of each individual and then developing a training program for him or her. The centers also provide guidance and counseling.

Four Regional Rehabilitation Training Centers located at Chennai, Cuttack, Lucknow and Mumbai provide technical support to the District Rehabilitation Centers and organize full-time training and management programs for the field workers.

There are six national institutes that provide technical advice and support to the government in formulating need based policies and programs for persons with disabilities. The national institutes offer a wide range of services in the field of education, training, vocational guidance and counseling, research and development of low-cost appliances for the rehabilitation of disabled persons.

Ministry of Rural Development

Swarnjayanti Gram Swarozgar Yojana

The Swarnjayanti Gram Swarozgar Yojana, introduced in 1999, is a self-employment generation program focused on poverty alleviation by ensuring appreciable sustained income for the *swarojgaries* (self-employed) over a period of time through group lending, etc. Similar programs include the Jawahar Rozgar Yojana, Integrated Rural Development Programme, and Training of Rural Youth for Self-Employment.

The Department of Rural Development has the authority for overall monitoring and evaluation of these schemes and also for releasing the central share of funds.

The programs are implemented by the District Rural Development Agencies through the Panchayat Samithis, with the active involvement of other Panchayati Raj Institutions, banks, and NGOs.

Ministry of Health and Family Welfare

The Ministry of Health and Family Welfare has set up various statutory bodies including the Medical Council of India, Nursing Council of India, Pharmacy Council of India and Dental Council of India. Some states like Karnataka, A.P. and M.P. have constituted paramedical councils. These bodies are responsible for ensuring quality training at the professional level in the subject area concerned. The Department of Family Welfare recognized the crucial role of training of health personnel in providing effective and efficient health care to the rural community. The pre-service and in-service training for different categories of health personnel are imparted through: (i) Basic Training of Auxiliary Nurse Midwife/Lady Health Visitor and (ii) Basic Training of Multipurpose Health Worker (Male).

The duration of the training program of the Auxiliary Nurse Midwife is one and half years and the minimum qualification for admission to this course is ten years of schooling, whereas the duration for the Multipurpose Health Worker (Male) is one year. Upon successful completion of the training, both male and female health workers are posted at Primary Health Centers, Rural Family Welfare Centers and other health centers in the country.

The Basic Training of Multi Purpose Health Worker (Male) scheme was introduced in 1984 as a 100% Centrally Sponsored Scheme. The training is provided through 56 training centers through health and family welfare training centers and through basic training schools for multipurpose health workers.

Ministry of Agriculture

The Education Commission (1964–66) recommended the establishment of agricultural polytechnics to impart vocational education in agriculture. The issue was considered by the Planning Commission, and in 1973 the Inter-Ministerial Committee and Indian Council of Agricultural Research appointed a committee, headed by Dr. Mohan Singh Mehta, for formulating the institutional design for vocational training in agriculture. The Committee suggested the establishment of farm science centers, later named Krishi Vigyan Kendras (KVKs). There are 492 KVKs, which act as centers for training farmers to update their knowledge and skills in improved agricultural technology, and training of extension personnel to orient them in the frontier areas of technology development. Provision of e-linkages has also been made in 200 KVKs. The KVKs are entirely financed by Indian Council of Agricultural Research.

Ministry of Youth Affairs and Sports

The Ministry of Youth Affairs and Sports provides financial assistance to NGOs for imparting vocational training and entrepreneurial skills to youth, based on local needs and talents. Assistance is also given to NGOs to hold youth leadership training programs and exhibitions involving arts, crafts, folk dances, paintings and various social themes concerning the role of youth. The Ministry is also implementing schemes of financial assistance to NGOs for the benefit of youth belonging to backward/tribal areas and tribes.

Ministry of Small Scale and Agro and Rural Industries

The implementation of policies and programs for providing infrastructure and support services to small enterprises is undertaken by the Ministry of Small Scale Industries and Agro and Rural Industries through its attached office, namely the Small Industries Development Organisation, and other organizations like the Khadi and Village Industries Commission (KVIC), Coir Board (a public sector undertaking), National Small Industries Corporation, and two training institutes, the National Institute of Small Industry Extension Training, Hyderabad, and the National Institute for Entrepreneurs Promotion and Training Institute, Tiruvalla. Currently there are 51 training centers under KVIC including 12 village industry training centers.

Skill Development Programs

A number of skill development programs have been launched by the Small Industries Development Organisation since its inception in 1954. The basic objective of these programs is to train unskilled and semi-skilled workers employed in small-scale industrial units, upgrading their technical skills and knowledge. The skill development training programs are conducted through small industrial service institutes in their workshops in different parts of the country. Skilled and semi-skilled workers employed in small-scale industrial units are selected for such courses. However, some freshly educated unemployed youths are also selected for learning the skills of various trades so that they may be able to find employment opportunities or start their own ventures.

The courses last from three to six months covering trades such as turner, fitter, machinist, welding shop practice, electric shop practice, scientific glass blowing, carpentry (woodworking), tools and die making, electroplating and powder coating, heat treatment, lens grinding, screen printing, electric motor winding, servicing and repair of two wheelers, book binding, tailoring, cane ware and sheet-metal components.

Entrepreneurship Development Programs

Entrepreneurship development programs of four to six weeks duration, with a usual intake of 30 participants, were launched in 1970. These programs are organized on a regular basis to cultivate the latest traits and capabilities in youth by providing them with various necessary and useful skills for setting up and managing small-scale industries. The program also imparts knowledge for the assessment of technical feasibility, economic viability, and commercial prospects of small-scale industry as a self-employment venture. The critical areas of product and process design, manufacturing practices, testing, quality control and assurance, appropriate machinery and equipment, project profile preparation, marketing avenues and techniques, product and services pricing, export opportunities, infrastructure facilities, finance and financial institutions, cash flow, industrial policy, etc., are also dealt with by experts. This is supplemented by visits to small-scale units and hands-on practice on machinery and process. This enables trainees to prepare their own project reports for which they are helped. Project reports are duly appraised, evaluated, and corrected in consultation with the experts. These programs are conducted through small industrial service institutes, regional training centers, and the Small Entrepreneurs Promotion and Training Institute at Tiruvalla and Ettumanoor.

Need-based Training

Need-based training courses are provided for different categories of entrepreneurs. For example, the Central Footwear Training Institute provides training for footwear manufacturing. The Tool Room and Tool Design Institutes provide similar training in the engineering industry.

Continuing Vocational Education and Training

The NIOS Model

The National Institute of Open Schooling (NIOS) offers 85 vocational courses through its 853 accredited vocational institutions spread over the country. The accredited vocational institutions include government-financed institutions such as the JSS as well as NGOs. As partners with NIOS, these institutions provide facilities to the students who register with them for vocational courses. The NIOS has also set up a network of about 2,500 study centers for program delivery through open learning and distance education.

The NIOS offers vocational courses in broad areas including agriculture, engineering and technology, health and paramedics, home science, information science and technology, business and commerce, and teacher training. Some vocational courses are offered in combination with academic subjects at the secondary and higher secondary level. Registration to various vocational courses is open throughout the year. The vocational courses are practical, with a 60% focus on practice and 40% on theory. However, most of the courses require at least the completion of eight to ten years of schooling as entry qualifications.

The IGNOU Model

The Indira Gandhi National Open University (IGNOU) was established in 1985 in New Delhi, with the objective to provide seamless access to sustainable and learner-centric quality education, skill upgrading and training to all by using innovative technologies and methodologies. The university has launched programs of vocational education in distance mode for the benefit of youth. It offers 77 vocational courses in various trades and skills at different levels for persons above the age of 14 even if they do not have a formal school certificate.

Ministry of Communication and Information Technology

Courses accredited by the Department of Electronics Accreditation of Computer Courses (DOEACC) under the Ministry of Communication and Information Technology are offered at the "0" level (foundation), "A" level (post-graduate diploma in computer applications), and "B" level (master in computer applications) by various institutions. DOEACC accredits, examines, and monitors computer training and education in the informal sector.

D. Problems and Issues of Vocational Education and Training

The skill level and educational attainment of the workforce determines the productivity, income levels, and adaptability of the working class to the changing environment. The low skill levels of the vast majority of India's population contribute significantly to low income levels and corresponding poverty.

The VET programs operated by the various ministries and departments of the central and state governments are inadequate both in quality and quantity to meet the current needs of the industry as well as to equip the poor and underdeveloped with fit-for-purpose skills for attaining meaningful and productive employment. The total annual training capacity of the above-mentioned courses, schemes, and programs for VET programs is around 3 million against the 12 million new entrants to the labor force every year.

As of 2007, the number of vocational institutes in India (5,000 ITIs and 7,000 secondary vocational schools) compares poorly with the 500,000 secondary vocational schools in the People's Republic of China. The comparison is also inadequate considering the number of skills imparted in the two countries. In all of India, ITIs cater to a meager 40 skills compared to 4,000 in the PRC.

Enrollment in vocational education in India is low by international standards. The share of vocational students vis-à-vis total enrollment at the secondary school level is around 3.5% in India, as against 55% in the PRC, 33% in Malaysia, 31% in the Republic of Korea and 12% in Mexico (World Bank 2006).

The poor employment scenario for people graduating from vocational institutes may be one of the reasons for the lack of interest of students towards VET. The "Evaluation Report of the Centrally Sponsored Scheme on Vocationalisation of Secondary Education" conducted in 21 states across five zones of the country by the Operational Research Group in 1998, found that

only 28% of vocational graduates were employed/self-employed and about 38.3% were found to be pursuing higher studies.

A study conducted by DGET in 2003, reviewing the employment experiences of former apprentices in six states, shows that close to two thirds were not employed in the trades for which they were trained and one third were trained in obsolete trades. A similar review of ITI graduates in the states of Orissa, Maharashtra, and Andhra Pradesh indicate that employers often experienced problems in finding employees with the proper skills in spite of the large number of ITI/ITC graduates produced in these states (Table 13) (World Bank 2006). It was noted by the employers that ITI graduates are often found to be lacking in computer applications, practical use of machinery and communication and teamwork skills.

Table 13: Percentage of Companies Experiencing Problems Finding Appropriate Skilled Employees

Name of state	Never	Occasionally	Frequently
Orissa	11.1	66.7	22.2
Andhra Pradesh	16.7	58.3	18.0
Maharashtra	43.8	43.8	12.4

In addition to the problem of a mismatch between the skills being taught and those required by industry, the high level of illiteracy and limited reach of the current VET system also contribute to the skill shortage felt by India's growing economy. The unorganized and informal sector absorbs the vast majority of the uneducated and untrained labor into low productivity jobs. Though a number of schemes and programs have been initiated by the government to raise skills in the rural and backward regions, training in the informal sector still takes place mostly through traditional apprenticeships. The lack of exposure of the trainer in this sector and the rapid obsolescence of traditional crafts and trades is raising unemployment and under-employment.

According to the National Sample Survey Report No. 517 on "Status of Education and Vocational Training in India, 2004–05" only 5% or so of persons in the 20–24 year age group were found to have received any formal vocational training and another 8% to have received non-formal training. Only 3% of rural youth (15–29 years) and 6% of urban youth were found to have gone through any kind of vocational training.

Vocational educational and training has been relegated to the back seat of the education system in India so far and the major problems facing the current VET system in India, leading to its low effectiveness and efficiency, may be categorized as follows:

Skill Mismatch between Demand and Supply

The VET system caters mainly to the needs of traditional manufacturing sector, which represents less than 10% of the total workforce. The requirements of modern high-tech industries and service sectors, as well as those of the unorganized sector, are not properly taken care of. The rapid obsolescence of technologies and failure to adapt swiftly to the changing needs of the world of work are aggravating the problem. The lack of worker information data and job profiles for the labor required by industry, and the lack of involvement by employers in the management of VET are also contributing to the mismatch between supply and demand of skills.

Cumbersome Management Processes

Vocational education and training fall under a plethora of ministries and departments. The absence of clear roles and lack of communication between these departments often lead to bottlenecks and unnecessary delays in execution and implementation of governmental policies and plans.

The current management structure is also highly centralized and has a poor procedural configuration. The ITIs are part of the government. Teachers and trainers are civil servants, and resources are part of the government budget. The absence of institutional autonomy renders issues such as recruitment of staff and trainers, appropriate changes in institutional structure and courses and other matters to follow the circuitous route of central decision making often resulting in long delays that hinder rapid response to labor market changes.

Absence of a Demand Driven Strategy

Although VET is an important sector for policy interventions for both the central and state governments, the outlook of the government toward it has so far been to institute support for the "welfare" of the disadvantaged and underdeveloped sections of society. VET in India has therefore remained supply driven and has failed to respond appropriately to the demands of the labor market.

The absence of comprehensive planning based on a spectrum of studies of the skill requirements, providing information on the current and future trained labor needs of all categories of skilled personnel required by different sectors of the economy, along with weak links with industry, has resulted in the current skill mismatch between supply and demand.

The adoption of a demand driven strategy and the development of public-private partnership models are methods that have been suggested for making VET more market oriented. Changing the role of the government in respect of VET, from simple service providers to facilitators and standard setters, has also been suggested by both the World Bank and the Task Force on Skill Development set up by the Planning Commission.

Inadequate Funding

Most vocational training institutes and skill development centers are dependent on the central or state governments for funding, and hence suffer from a perpetual paucity of funds. The funds provided are hardly adequate for running the sanctioned programs and no developmental activities can be supported. Delays and even the non-transmission of government prescribed funds to these institutions is a common feature.

The setting of student fees and other financial issues involving ITIs is retained by the respective state governments. The institutional functionaries do not have autonomy or incentives for resource generation. Expenditures on critical training inputs remain low as the majority of the funds is spent on salaries.

The end users, be they industries or employers, hardly contribute in any way towards the training costs of ITIs or other vocational training centers. Little attention has been paid so far to the use of financing as an innovative means to encourage private enterprises to share costs in the training institutes.

Absence of a National Qualification Framework

Socio-economic circumstances and the necessity for many people to begin earning a livelihood at an early age are major reasons for the growth in high school dropout rates in India. These out-of-school youths and a majority of others in the informal sector generally acquire low-level skills either while helping their parents or relatives at work or through traditional apprenticeships, or while working in micro-organizations. Such people do not have a formal certificate and thus earn low wages and can be exploited by employers.

However, though their productivity may be low, their contribution to the national GDP cannot be ignored. If the country could create a system of certification which not only recognizes workers' skills but also makes them eligible for further education and training according to their economic circumstances, it would not only help the workers to earn a decent living, but

would also contribute to the national economy through improved productivity.

Hence, there is an enormous need for a National Qualification Framework (NQF) to develop a process for recognition, standardization, and up-grading of skills. The NQF is also likely to provide a pathway for creating national skill standards on a competency basis and providing vertical and horizontal mobility.

Inadequate Links

Inadequate links among VET institutes and industries and communities are reasons for the incoherence between demand and supply of technical labor in the country. Increased involvement by industry at all levels of management and policymaking as well as cost sharing needs to be achieved through public-private partnerships.

VET institutes also suffer from a lack of interaction with institutions of higher learning such as engineering colleges and institutes of technology, resulting in compartmentalization between these institutes, and subsequently reducing the opportunities for vertical mobility of the students and teachers of VET institutes. Government policies need to be reframed in order to bring about greater linkage between vocational education and training and the mainstream of education.

Shortage of Quality Trainers

A survey conducted of 262 ITI teachers in 14 states in 1998 revealed that 61% of the teachers had less than 12 years of schooling and a third had no industrial experience. Furthermore, two thirds of the instructors had not received any training in the last five years (World Bank 2006).

The general lack of connection between the training institutes and industry leads to a lack of exposure to modern technologies among trainers and instructors. Inadequate facilities and lack of proper incentives, vision, and attitudes regarding the importance of training of trainers have led to poor quality of trainers in the ITIs and other vocational institutes. The failure to upgrade the knowledge and skills of the trainers results in low quality of training and subsequently to low-quality products.

In addition to the above problems and weaknesses of the VET system in India, a lack of teaching materials, both in print and non-print media, for effective implementation of curricula and inadequate infrastructural facilities in terms of buildings, laboratories, equipment, etc., are also major hurdles to the development of a vibrant vocational education and training system.

E. Recent Government VET Initiatives

Recent Initiatives in Skill Development

The need for skill development, especially for the less educated, poor and school dropouts (63% of all students who enter school drop out before reaching Year 10) was emphasized by the Prime Minister of India.

In accordance with the policies of the government, the DGET has already undertaken certain initiatives for the development of a new strategic framework for skill development of school dropouts and existing workers especially in the informal sector, in close consultation with industry, micro-enterprises in the informal sector, state governments, experts, and academia. Under this scheme, a provision of Rs5,550 million has been made to fund the activities. On average, Rs5,000 per person would be provided from this scheme for training, testing, and certification of the skills of each person.

Introduction of New Curricula

In order to keep pace with the technological changes taking place in industry and to ensure that training is demand driven, the following initiatives have been taken by the DGET, under the Ministry of Labour and Employment.

During 2002 to 2005, 47 new employable trades with duration varying from 6 months to two years have been brought under the purview of Craftsman Training Scheme (CTS). All state governments have been requested to introduce these trades as per their need by creating necessary infrastructural facilities.

Thirteen new trades in informal sector have been introduced under the Apprenticeship Training Scheme (ATS). Course curricula of 44 trades under CTS and 43 trades under ATS have been revised during 1997–2003. Twenty-one unpopular trades have been deleted from the purview of CTS and ATS from 1997 to 2005.

DGET has taken up a scheme for testing and certification of skills acquired through non-formal means. The scheme is being implemented initially on a pilot basis. Competency-based skill standards have been developed for 46 skill areas.

The Construction Industry Development Council and the National Academy of Construction, Hyderabad have been identified by DGET as Apex bodies for carrying out the testing and certification of workers related to construction sector.

The Cane and Bamboo Technology Centre, Guwahati, has been identified as the apex body for testing and certification of skills of workers in the area of bamboo technology.

Apart from the Construction Industry Development Council and the National Academy of Construction, Hyderabad, the scheme is already under implementation by other state directorates, including Punjab, Kerala, Tamil Nadu and Jammu and Kashmir and Orissa.

Building Centers of Excellence

With globalization, the benchmarking of skill standards according to world standards has become necessary. The production of skilled workers at international standards is a precondition for competing successfully in the global market. With this in mind, the process of upgrading the ITIs into Centers of Excellence has been undertaken by the government.

The Union Finance Minister, in his Budget Speech of 2004–05, announced measures for upgrading 500 ITIs. Subsequently, following the advice of the Ministry of Finance, action was initiated to upgrade 100 ITIs from domestic resources and 400 ITIs with World Bank assistance. The 100 ITIs to be upgraded from domestic resources are distributed among 26 states and union territories (other than J&K, Sikkim, and NE States) in proportion to the number of government ITIs in those states.

The objective of this scheme is to upgrade the 100 existing ITIs into Centers of Excellence for producing multi-skilled workers that meet world standards. The highlights of the scheme are the introduction of multi-skilling courses during the first year, followed by advanced/specialized modular courses based on the industrial cluster approach with multi entry and exit provisions, and developing public-private partnerships in the form of Institute Managing Committees (IMCs) to ensure greater and more active involvement of industry in all aspects of training.

The curricula for the various training courses have been developed with the active involvement of industry. A total of 192 modules to be used in the curricula have been developed so far and are available on the DGET, Ministry of Labour and Employment website (http://dget.nic.in/coe/main/Index.htm).

Training courses following this new pattern have already begun at 83 ITIs during FY 2005–06 and from August 2006 at another 13 ITIs. In the remaining 4 ITIs (located one each on Andaman and Nicobar Islands, Dadar and Nagar Haveli, Daman and Lakshadweep, where major facilities are to be created before start of training) the programs are likely to start within the period from February 2007 to August 2007.

DGET has also started developing curricula for short-term courses in association with employers' organizations, state governments, experts, vocational training providers, and other groups. As of this writing, curricula for 118 courses have been developed.

In his budget speech for 2007–2008, the finance minister proposed the upgrading of the 1,396 ITIs through public-private partnerships into Centers of Excellence and indicated that Rs750 crores had been put aside for the purpose. He also announced the establishment of 1,500 new ITIs in blocks which currently had no ITIs, 12 regional vocational training institutes, 11 advanced training institutes, and four institutes for training of trainers, one in each zone (A list of sectors for which the development of curricula has been undertaken is given in Appendix I and a list of curricula approved by the NCVT in Appendix II).

Skill Development Framework for the Informal Sector

A new framework for skill development in the informal sector has been formulated by the DGET. It emphasizes the need for demand-driven, short-term training courses based on modular employable skills, to be decided in consultation with industry, community, and other stakeholders. Flexible delivery mechanisms including part-time, weekend, and full-time courses have been suggested, and the introduction of different levels of programs (foundation level as well as skill upgrading level) to meet the demands of various target groups have been initiated. To make the training cost effective, the optimum utilization of existing infrastructure has been suggested.

One of the most important decisions and initiatives taken by the DGET involving the testing and certification of prior learning or skills acquired informally. This process aims to provide informally trained workers to get their skills recognized officially and thereby to give them the means to acquire better jobs and also increase their opportunities for acquiring loans from banks and other funding agencies for self-employment. The process of setting up a National Vocational Qualification and Certification System has been initiated for the standardization of certification, to ensure that it is recognized nationally by both government and private agencies.

Introduction of Modular Employable Skills

The introduction of modular employable skills (MES) lies at the heart of the new skill development program. The concept of MES is based on the identification and development of a "minimum skills set" which is sufficient

to get employment in the labor market or to enable a person to earn a living through self-employment. The flexibility of such modular credit-based courses is likely to lead to better opportunities for skill upgrading, multi-skilling, multi-point entry and exit, vertical mobility and recognition of prior learning through certification of skills acquired informally.

MES are likely to benefit different target groups such as workers seeking certification of their skills acquired informally, workers and ITI graduates seeking skill upgrading and early school dropouts and the unemployed. Courses at different levels in different vocations need to be offered depending on the need of the various target groups and other stakeholders. The modules in a sector, when grouped together, can lead to a qualification equivalent to the National Trade Certificate or higher.

The following table depicts how different groups may benefit from MES programs.

Table 14: Benefits of Various Target Groups from Modular Employable Skills

Serial no. (SI)	Target group	Training		Testing & certification of competencies
		Skill acquisition	Skill up-gradation	
1	Less educated/out-of-school youth/unemployed/persons without employable skills	✓		✓
2	Workers who have acquired skills informally		✓	✓
3	ITI graduates		✓	✓

The introduction and implementation of MES will bring about better employability and mobility, higher productivity and wages, less exploitation, improved social status, and better opportunities for the procurement of loans for self-employment from various financial and other institutions for the individual. For employers, the likely benefits will be the improved quality and productivity of the workforce, compliance with quality assurance systems such as ISO, and reduction of the cost and difficulties of in-house training. Society as a whole is likely to benefit from the MES scheme through higher productivity and reduction in poverty.

Developing Partnerships with Industry

DGET initiated a pilot program named the Formation of Institute Managing Committee for ITIs in 1998 in collaboration with the Confederation of Indian Industry to improve cooperation between industry and ITIs. Under this

concept, industry is seen as partners rather than advisors. An IMC is formed at the ITI level, and manages some of the activities of the ITI. Members of the IMC come from the state government, industry, ITI and others. The chairperson is a representative of the local industry. This committee works under the supervision and control of a steering committee formed at the state level. The official in charge of the vocational training at the state level serves as the chairperson of the steering committee.

IMCs have been constituted for about 500 ITIs in 28 states. The experience so far has shown that an actively functioning IMC can bring about significant improvements in the functioning of the ITI through better upkeep of machinery and equipment, training and development of faculty, organizing campus interviews, placement of trainees as apprentices, arrangement of on-the-job training and industrial visits, revenue generation, etc.

DGET aims to implement and monitor the scheme through six Regional Directorates of Apprenticeship Training, which will act as its regional offices. It also plans to create project cells at the national and regional level to ensure close monitoring and better management of this huge program.

Providing Opportunities for Vertical Mobility for Graduates of the Vocational Stream

The general reluctance of school leavers to undergo vocational education has been observed, as these programs are considered terminal in nature and seem to offer negligible opportunities for future enhancement of qualifications. This issue was examined by the All India Board of Vocational Education and All India Council for Technical Education (AICTE) in September 2003. The following decisions were taken to provide opportunities for vertical mobility for ITI graduates and students of other vocational institutions:

a) ITI graduates and students of other vocational institutes will be permitted to sit for the entrance examinations for diploma-level courses even if they have not studied physics, chemistry, and mathematics in their prior schooling, provided they are able to compete in these subjects in the entrance exams.

b) ITI students and other vocational students who have completed 12 years of schooling will be permitted to join the second year of the diploma-level course provided they complete the subjects of the first year diploma level courses that they have not taken at the ITI or higher secondary school level. The respective State Boards of Technical

Education will have to ensure that the polytechnics arrange extra classes for such students. However, the All India Board of Vocational Education recommends that only those students who secure 60% marks at the 10+2 stage of schooling or at the ITI should be considered eligible for consideration for lateral entry into polytechnics.

F. Current Challenges of the VET System

Skills and knowledge are the driving forces of economic growth and social development of any country. The economy becomes more productive, innovative, and competitive through the existence of more skilled human potential. The level of employment, its composition, and the growth of employment opportunities are the critical indicators of the process of development. Globalization and the increasing pace of technological change provide both challenges and opportunities for economic expansion and job creation. In taking advantage of these opportunities, the level and quality of a nation's skills are becoming critical factors. Countries with higher skills adjust more effectively to the challenges and opportunities of globalization.

To address this challenge, the government's 11th Planning Commission constituted a Task Force on Skill Development to make recommendations on how to meet the requirements of skilled labor for India's growing economy. The Task Force has noted that "there has to be a paradigm shift in the national policy on skill development...." and has proposed the establishment of a National Mission for Skill Development in accordance with the wishes of the Prime Minister.

The process of India's modernization, which has begun to gather momentum, requires a large reservoir of skilled and trained workers. India's entrance into the global market also requires the development of world standards in skills and product quality in order to compete effectively with other countries. In order to meet these demands, it is essential to expand vocational education and training and ensure that the skills imparted by the ITIs and other vocational institutes keep pace with the competencies required by industry and the expanding world of work.

The picture of 260 million people living under the poverty line and 93% of the labor force working in the unorganized sector with little or no education and low skill levels is likely to pose an impediment for the process of sustained economic growth in India. Both demand and supply-side constraints have inhibited skills development in this sector so far. Many workers in the unorganized economy have never been to school let alone to vocational training institutions. The formal training system is not

designed to offer skills to people with low education, and particularly not to those in the rural non-farm sector. Recent government initiatives for providing skill development opportunities to people in this sector may still be enhanced. Most workers continue to learn trades on the job through informal apprenticeships in the workplace from other traditional craft people.

The aim of the government's initiative in constituting a National Mission on Skill Development is to redress this problem. The Working Group on Skill Development has specifically stressed the need to focus on the skills required in the informal sector and to provide specific and fit-for-purpose skill sets.

The current job market provides a large number of job opportunities that do not require long-term education or training backgrounds of two to three years. Rather, for many entry-level jobs across industries, the skills can be gained from focused, competency-based short-term courses or training. The concept of MES has been advanced based on this observation and work has begun to make the VET system more flexible with short-term courses, as suggested the Working Group on Skill Development. Modular credit-based courses are also likely to offer better opportunities to those who are already employed to upgrade their skills at their own convenience. The necessity of developing a National Qualification Framework (NQF) for formalizing and upgrading prior skills, along with the standardization of accreditation and certification for VET institutes, is another pressing need.

In view of the current situation, the following may be identified as priority issues that need immediate attention in order to strengthen VET in India:

- Identifying emerging requirements of training
- Increasing the number of trained persons every year
- Improving the effectiveness, efficiency and relevance of training
- Improving skill development in the informal sector
- Developing a National Qualification Framework
- Improving the training of trainers/instructors

The VET system in India therefore faces the challenges of *widening the reach of VET, making VET more market oriented, imparting entrepreneurial skills, checking student dropout rates, and increasing the number of skilled persons on the one hand and meeting emerging skill demands, building Centers of Excellence and developing knowledge workers and introducing life-long learning on the other.*

IV. POLYTECHNIC EDUCATION AND TRAINING

A. History and Growth

The history of polytechnic education in India can be traced back over 150 years. Licentiate courses, initially in civil engineering and later in mechanical and electrical engineering, were offered in the four engineering institutes set up by the British rulers in Madras, Calcutta, Poona, and Roorkee between 1830 and 1850. These institutions were primarily established by the British government in order to meet the need for technical personnel to maintain the limited infrastructure existing at that time.

There were 43 polytechnics at the time of independence with an intake capacity of 3,400 students. This capacity has grown steadily over the years. The number of polytechnics in 2005–2006 has been reported to be 1,244 with an intake capacity of 265,416 students, offering diploma programs in more than 100 disciplines.

After independence, the government's educational policy focused on the creation of a strong infrastructure in science and technological education to support rapid industrialization. In accordance to this, emphasis was laid on the expansion and creation of polytechnic education facilities from 1950 through the successive Five Year Plans. The major objectives of industrialization was to make the country self-reliant in a number of technological areas such as production, manufacturing, construction, power generation, water resources management, and transportation.

Table 15 shows the growth of polytechnics in India in terms of number of institutes, annual intake capacity, and turnout, from independence to 2004.

Table 15: Growth of Polytechnics in India

Year	Number of polytechnics	Intake per year	Turnout per year
1947	53	3,670	1,800
1960	195	26,000	16,500
1980	332	49,000	27,000
1986	746	115,000	55,800
2004	1,244	256,416	—

Source: United Nations Educational, Scientific and Cultural Organization: http://unesdoc.unesco.org; Educational Institutions Resource Bank: http://www.indiaedu.com.

During the late 1960s and thereafter, in addition to the selective quantitative expansion, the emphasis significantly shifted to consolidation, optimum utilization of existing facilities, expansion of facilities in areas where weaknesses existed, creation of infrastructure in areas of emerging technologies vital for the development of the country, and the improvement of quality and standards of education.

During the 1980s, the central and state governments recognized an urgent need for revamping the country's Technician Education System to make it demand-driven, with relevant courses in new and emerging technologies, adequate infrastructure resources, competent faculty and effective teaching and learning processes. The state governments helped and renovated the system, and assistance was provided to 531 polytechnics in 19 states and the union territory of Pondicherry through the World Bank's First and Second Technician Education Projects. The Third Technician Education Project involving polytechnics in the states not included in the two earlier projects has just been completed.

The Expert Group on Policy Initiatives for Technician Education, set up by MHRD in 1998, recommended that with the rapid development of technology, significant and qualitative changes in the requirements for technician engineering labor were taking place. It found that the position could no longer be classified as a single type, between the craftsperson and the engineer. Rather, it found that polytechnic graduates needed to serve in multiple level positions and to perform and manage various levels of activities on the shop floor and in the field.

In view of the above, it concluded that it was necessary to re-orient and re-structure the total polytechnic education system.

B. Overview of the Polytechnic Education System

Polytechnic education, which forms the second level of technical education in India, offers diploma courses in engineering. At present, there are 1,244 polytechnics situated in various parts of the country with a total training capacity of 265,416 offering diploma programs in more than 100 disciplines.

Courses of three years in duration are generally offered in a variety of courses among which the more common are engineering courses such as computer science and technology, and civil, mechanical, and electrical engineering. Diploma courses in pharmacy, HMCT, and architecture are also offered by some institutions.

Table 16: Distribution of Polytechnics in States and Intake Capacities

Region	State/Union territory	Diploma							
		Engineering		Pharmacy		HMCT		Architecture	
		NOI	Intake	NOI	Intake	NOI	Intake	NOI	Intake
Central	1. Madhya Pradesh	49	9,094	27	1,520	—	—	—	—
	2. Chhattisgarh	10	1,170	01	30	—	—	—	—
	3. Gujarat	42	12,937	09	570	—	—	1	40
	Total	**101**	**23,741**	**37**	**2,120**	**—**	**—**	**1**	**40**
Eastern	1. Mizoram	04	480	01	150	—	—	—	—
	2. Sikkim	04	390	01	60	01	60	—	—
	3. West Bengal	57	8,725	03	160	10	780	—	—
	4. Tripura	03	440	01	60	—	—	—	—
	5. Meghalaya	03	440	—	—	—	—	—	—
	6. Arunachal Pradesh	02	320	—	—	01	20	—	—
	7. Andaman & Nicobar	02	245	—	—	01	20	—	—
	8. Assam	13	1,803	02	150	—	—	—	—
	9. Manipur	03	285	—	—	—	—	—	—
	10. Nagaland	03	285	—	—	—	—	—	—
	11. Orissa	31	6,495	14	740	01	60	—	—
	12. Jharkhand	21	2,997	02	450	01	45	—	—
	Total	**146**	**22,905**	**24**	**1,470**	**15**	**985**	**—**	**—**
North	1. Bihar	13	2,745	—	—	02	180	—	—
	2. Uttar Pradesh	87	10,691	09	430	03	270	—	—
	3. Uttranchal	17	2,253	13	570	03	140	—	—
	Total	**117**	**15,689**	**19**	**740**	**8**	**590**	**—**	**—**
North-West	1. Chandigarh	3	555	02	100	—	—	2	60
	2. Haryana	24	7,460	16	955	—	—	3	160
	3. Himachal Pradesh	7	1,215	02	80	—	—	2	45
	4. Jammu & Kashmir	12	2,730	01	40	—	—	6	210
	5. New Delhi	15	3,841	04	220	—	—	4	140
	6. Punjab	48	12,450	17	1,020	—	—	5	170
	7. Rajasthan	21	1,955	17	969	—	—	1	20
	Total	**130**	**30,206**	**59**	**3,384**	**—**	**—**	**23**	**805**
South	1. Andhra Pradesh	100	19,645	49	2,720	6	290	—	—
	2. Pondicherry	5	890	01	20	1	20	—	—
	3. Tamil Nadu	210	59,140	15	1,170	13	810	—	—
	Total	**315**	**79,675**	**65**	**3,910**	**20**	**1,120**	**—**	**—**
South-West	1. Karnataka	205	38,885	88	5,100	—	—	—	—
	2. Kerala	49	9,715	17	1,015	4	300	—	—
	Total	**254**	**48,600**	**105**	**6,115**	**4**	**300**	**—**	**—**
West	1. Maharashtra	172	43,230	105	6,280	19	1,185	1	60
	2. Goa	7	1,100	01	10	2	120	—	—
	3. Daman & D, Dadar, N.H.	2	270	—	—	—	—	—	—
	Total	**181**	**44,600**	**106**	**6,290**	**21**	**1,305**	**1**	**60**
	Grand Total	**1,224**	**265,416**	**415**	**24,029**	**63**	**4,020**	**25**	**905**

NOI = number of institutions.
Source: Press Information Bureau, Government of India: http://pib.nic.in.

Table 16 gives the number of polytechnic institutions in the various states of India in 2004–05 and their annual intakes in various disciplines.
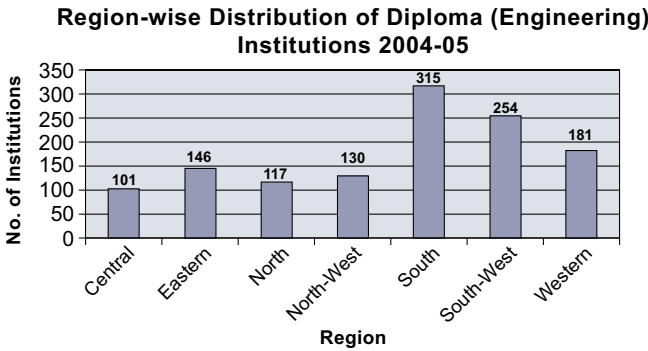
The regional distribution of polytechnic institutions is also depicted in Table 17 and Figure 6. The wide variations between the different states and regions of India in respect to the number of polytechnics and student intake capacities are apparent. The southern and western states are well ahead in terms of capacity, whereas the eastern and northern states lag. Thanks to liberal policies, four states—Andhra Pradesh, Maharashtra, Karnataka, and Tamilnadu—have permitted the establishment of private institutions, which admit 50% of the students on a full fee payment basis. However, the quality of the private polytechnics is not uniform in all the states in the country. There has been a wide variety in the quality of the graduates from the private polytechnics.

Table 17: Regional Distribution of Diploma Level Institutions

Region	Number of institutions	Total intake per year	Population (millions)	Intake per million population
Northern	165	23,180	22.8	1,012
Southern	455	58,730	16.4	3,581
Eastern	62	7,380	21.8	339
Western	264	34,890	18.7	1,866

Source: United Nations Educational, Scientific and Cultural Organization (UNESCO): http://unesdoc.unesco.org.

Figure 6: Regional Distribution of Diploma (Engineering) Institutions and Intake in Diplomas in 2004–2005

Region-wise Distribution of Intake in Diploma (Engineering) 2004-05

Source: Ministry of Human Resource Development, Government of India: http://education.nic.in.
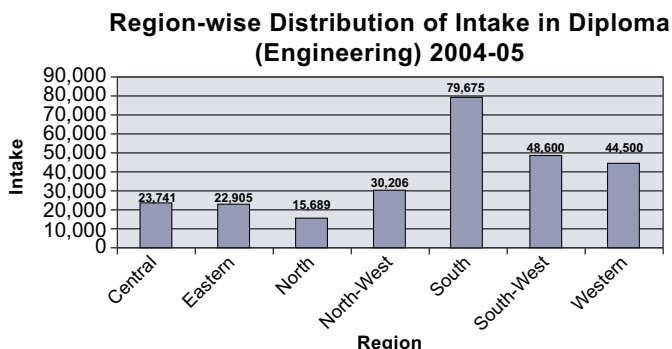
Management of the Polytechnic Education System

The polytechnic education system, though on the concurrent list of the governments at the central and state levels as part of the technical education sector, is mainly managed by the state agencies following state policies.

Most state governments have established State Directorates of Technical Education, which are the chief funding and administering agencies of the polytechnics in that particular state. In some states, there is a Board of Technical Education, which is responsible for functions such as curriculum development, conduct of examinations, institutional evaluation, accreditation, and certification. In most of the states, such boards do not exist and where they are established, they function as a part of the Directorate. State Boards of Technical Education function independently only in a few states.

Central intervention in the polytechnics is rare, and is done particularly for quality improvement. The All India Council for Technical Education (AICTE) is the leading body at the national level for the growth, development, and control of technical education as a whole and therefore broadly covers polytechnics as well. It has a number of boards, and the Bureau of Technician Education specifically looks into the developmental needs of polytechnic education. The AICTE has also established a National Board of Accreditation, which has been given the exclusive function of accreditation of technical institutions and programs including polytechnics.

Financing of Polytechnics

There are three categories of polytechnics in India: government polytechnics, government aided polytechnics and self-financing polytechnics.

The government polytechnics are entirely funded by the state government, both for initial capital expenditures and for recurring and non-

recurring expenses. The supported institutions receive government grants up to a maximum of 90% of the recurring expenses only. Self-financing polytechnics do not receive any government grants and generate their own funds through tuition fees and other resources.

The Bureau of Technical Education, established in the Ministry of Human Resource Development, is the main funding agency at the national level. It has funded some polytechnics through central intervention schemes for their development, in areas such as modernization, community polytechnics, establishment of audio-visual centers, advanced diploma courses, industry-institute interaction, computerization, continuing education, and removal of obsolete courses.

As a result of their total or near total dependence on government funds, the government and government-aided polytechnics operate under perpetual financial constraints. There are some central intervention schemes such as Direct Central Assistance, which provides some funds to selected polytechnics for modernization. However, the effort so far has been meager and is insufficient to support most of the institutions. There has been no attempt on the part of these institutions to generate resources by offering services to the community and surrounding industries, due to the absence of concrete government policies in this regard.

Presently, under a World Bank Assisted project implemented in three phases, most of the government and government-aided polytechnics have received substantial funding to modernize laboratories and classrooms as well as to improve infrastructure including student and faculty residences. This has helped to improve the ambiance and quality of the teaching-learning process. Some good polytechnics have been selected in each state for further development as part of another World Bank project named the Technical Education Quality Improvement Programme (TEQIP).

Supporting Agencies

National Institutes of Technical Teacher Training and Research

The four National Institutes of Technical Teacher Training and Research (NITTTRs, formerly known as Technical Teachers' Training Institutes) were established during the period from 1965 to 1967 in Bhopal, Calcutta, Chandigarh and Chennai, as autonomous bodies for the improvement of polytechnic education and the enhancement of its efficiency and effectiveness. Initially these institutions conducted teacher-training programs lasting one-and-a-half and two-and-a-half years, leading to a diploma in technical teaching. These conventional long-term teacher training programs,

which were offered in the early years, had to be changed in terms of content, form, mode, and duration to match the needs of polytechnic teachers and the constraints of the polytechnic system. These programs, in addition to updating the technical contents, had to focus on the development of instructional competency and managerial skills through innovative programs.

NITTTRs have made a substantial contribution to the design of admission tests, establishment of Item-Banks, introduction of comprehensive student assessment systems and the promotion of research studies in this area.

The National Institute of Technical Teachers Training and Research (NITTTR) provides extension services in their various locations. The NITTTR also provides extension services to the community polytechnics through assistance in the areas of curriculum development for non-formal training programs, implementation of socio-economic surveys, training of faculty in planning and implementation of rural development projects involving the transfer of technology, monitoring and evaluation of such projects, and the training of rural youth in rural vocations and occupations.

Other Support Agencies

Many other professional bodies and agencies support the polytechnic education system directly or indirectly. They include the Institution of Engineers, Indian Society for Technical Education (ISTE), Computer Society of India, Department of Science and Technology (DST), and Department of Electronics (DOE). Associate membership in the Institution of Engineers has been one of the avenues for diploma holders to upgrade their qualifications. Recently, some states have made arrangements with engineering colleges to admit willing and qualifying diploma holders to engineering degree programs for an extended period of three years.

The Institution of Electronics and Tele-Communication Engineers, in addition, provides some postgraduate diploma programs in computer science and electronics. The ISTE, DST, DOE, and Computer Society of India, also have programs to support polytechnic education. The ISTE conducts some 35 summer and winter schools annually exclusively for polytechnic teachers. About 800 to 1,000 teachers attend these programs every year. The Apprenticeship Board has programs to provide industrial training to polytechnic teachers and also provides apprenticeship training to polytechnic graduates. Many industries and industrial organizations have also contributed to the development of polytechnic education through training provisions.

The Colombo Plan Staff College for Technician Education in Manila, Philippines, conducts training programs for polytechnic teachers and administrators. Polytechnic education also has the benefit of international

inputs through fellowship training programs and UNDP-assisted projects for upgrading in specific areas. Presently, a massive input is coming to the polytechnic education system through the World Bank Assisted Project. Some international projects such as UNDP assisted and World Bank Assisted Projects have helped improve the total quality of the polytechnic education system.

C. Problems and Issues of Polytechnic Education System

With India opening its doors to multinational corporations and the advent of globalization and technological advancement, Indian industry is undergoing drastic changes. In order to be highly competitive in the domestic and international market, there is an acute need for improvement of the quality of technical labor. Though the number of polytechnics has increased in the last five decades, the quality of the output is often inadequate. The polytechnic or technician education system suffers from a number of problems and its effectiveness, efficiency and outreach can be said to be relatively poor.

There are a number of major problems facing the technician education system, described in the following sections.

Lack of Autonomy at the Institutional Level

The current management structure of polytechnics is highly centralized and has very poor procedural configuration. All decision-making rests with the central and state government agencies and there is no delegation of powers to the institutional level. The centralized management procedure sometimes makes even day-to-day decisions in respect to administrative, academic, and financial matters difficult. The centralization has also rendered recruitment procedures cumbersome, and made the appointment of faculty and other staff time consuming. In addition, inadequate support and administrative staff leads to low efficiency and effectiveness of the polytechnic education system.

The lack of autonomy at the institution level hinders local initiative in innovation and developmental ideas.

Shortage of Quality Teachers

The shortage of teachers in general and good teachers in particular is a major contributor to the poor quality of output from the polytechnics. The faculty entering the polytechnics are mainly fresh graduates from engineering colleges who lack the required industrial orientation and practice-based

experience for imparting effective instructions.

Quality improvement program (QIP) facilities available to engineering college teachers are not extended to polytechnic teachers. No clear policy exists to link professional development and career growth. While NITTTRs conduct a large number of programs, they are neither mandatory nor recognized as necessary for career advancement.

The lack of professional development opportunities for polytechnic teachers results in a lack of motivation and poses a major threat to the retention of quality teachers in the system. The situation is further aggravated by unattractive salaries, lack of incentives and inadequate career growth opportunities and poor service conditions.

Lack of Demand Driven Courses

The bewildering pace of technological advancement is leading to the rapid obsolescence of educational courses and physical resources such as lab equipment and ICT hardware and software. The current polytechnic system is ill equipped to keep pace with this fast rate of technological change occurring in industry, resulting in capability mismatches between the supply and demand of technical labor and thus to shortages of demand-driven, industry needs-based courses.

Weak Implementation of Curriculum

Classroom instruction is still predominantly lecture based, and alternative instructional strategies such as industrial visits, group discussion, case studies, and project method are not widely practiced. Learning experiences that provide field and industrial practices for skill development are not followed. A lack of industrial exposure and practice-based experience among teachers also act as a drawback in the process of imparting quality education in most polytechnics.

Poorly equipped classrooms, laboratories, workshops and inadequate IT facilities pose major problems for the adoption and implementation of appropriate instructional strategies and new teaching-learning methods. A lack of professional development of teachers adds to the woe of inadequate support mechanisms in the classroom, such as media hardware, demonstration kits, etc., as required for effective classroom management and improved delivery system.

The lack of high quality instructional materials, both in print and non-print media, for the effective implementation of curricula is another problem

hindering quality output. In addition, most polytechnics do not have a proper library or internet facilities.

Inadequate Resource Generation

The government and government-aided polytechnics are generally starved of funds and the system as a whole has been given very meager allocations. The funds provided have been barely sufficient to maintain the institutions and run the sanctioned programs. Developmental needs and modernization requirements have remained mostly unmet. Often the funds allocated to the polytechnics under the prescribed norms of the AICTE are not made available on time.

The absence of a policy on resource generation makes the public and government-aided polytechnics depend solely on government funding. The fee structure, being very low and insufficient to meet the training costs, results in a high level of government subsidies for training diploma holders. The end user industry, on the other hand, may need to consider increasing its share and contribute more toward the training cost of diploma holders.

D. Restructuring of Polytechnic Education System

A drastic restructuring of the polytechnic education system is required in order to resolve the problems stated above. The following changes need to be brought about.

Increase the Flexibility of the System

The rigidity of the current polytechnic education system in respect of the nature of the course offerings, entry and exit points and levels of course offerings by a particular institution are hindering the process of development required to meet the fast growing need for technician labor in the country. In response, flexibility must be introduced in course offerings, entry and exit options, and levels of programs in order to make the system more accessible and adaptable to changing needs. This may be done through the introduction of the following reforms.

Modular and Credit-Based Courses

Modular and credit based courses provided at one or more levels, in the area of specific skills, technologies, and management will permit certification on

the basis of credits accumulated by an individual over a period of time. The courses should be designed in such a way that the pace of learning can be decided by the learner to suit his or her individual requirements and learning style. Credit-based courses will also provide greater scope for horizontal mobility.

Multi-Point Entry and Exit

All programs and courses in the technical institutions should allow people to enter with different capabilities and at different periods. It must also be possible for the students to exit from courses at different points of time, carrying the credits earned by them for the programs completed, with the option of being able to come back within a reasonable period of time to continue the program for the remaining credits to achieve certification. Modular- and credit-based programs of different levels are likely to facilitate the system of multiple-point entry and exit.

Levels of Courses

To meet the requirements of the different categories of technical labor required by industry and to facilitate the process of continuing education, the polytechnic education system needs to offer programs to train different levels of technicians. The institutional infrastructure created should therefore focus on one or more categories of labor needs at a single institution. While each of these levels will provide a terminal program for employment at the appropriate level, it must be possible for an individual to move to the following level if he or she has the capability to undertake such programs. Hence developing links between these different levels is of utmost importance. This will reduce the current problem of compartmentalization between the different levels of technical education and enhance the opportunities for vertical mobility.

Introduction of programs at multiple levels, in multiple shifts and during vacations in a number of disciplines will result in a better utilization of institutional resources and may lead to resource generation by offering customized programs for industry.

Provide for Greater Horizontal and Vertical Mobility

The introduction of multiple level technician education under a single umbrella will make opportunities for higher education more accessible. Modular and credit-based courses allowing multi-point entry and exit will allow students

to move up the ladder depending upon their capabilities. Credit-based course offerings will also provide smoother pathways for horizontal mobility for acquiring multiple competencies.

Continuing Education Facilities

Today, the courses offered in most polytechnic institutions are designed to provide education and training to school leavers and pre-service students. However, with the growing importance of life-long learning, polytechnic institutions need to provide continuing education programs. The introduction of modular credit based programs at various levels is likely to facilitate this.

The introduction of continuing education programs on a wide scale will improve links with industry and hence facilitate the process of developing quick response to emerging technologies, help in the design of instructional strategies oriented to suit the needs of industrial practices, add to the capability of the faculty, generate additional resources, and help industry through the sharing of resources in terms of faculty, equipment, and other facilities.

Autonomy of Institutions

The current system of technician education is highly rigid and gives very little autonomy to institutions in terms of administration, academics, and financial operations. In order to bring change and innovation, which are central to excellence in any system, the public and government-aided polytechnic institutes need to be given more autonomy in all those areas.

Administrative autonomy will allow each institute to have the necessary authority to bring about changes in its organizational structure and type of people required for effective and efficient management of the programs and activities of the institute. It will also encourage institutes to be efficient in decision-making in respect of many operational matters such as recruitment, deployment, and training of staff, undertaking consultancy and generating resources.

The current highly centralized financial authority of the polytechnic education system needs to be de-centralized to the institutional level. Such financial autonomy will result in better utilization of institutional resources and the timely procurement of inputs crucial for undertaking various programs and activities. Institutions should also have the authority to augment resources through consultancy and to provide testing services for industry and the surrounding community. They should also have the freedom to plough back these resources into institutional growth and development.

Academic autonomy is required to encourage new ideas in respect to course offerings, curricula, instructional strategies, systems of student assessment, etc., and developing innovative methods of instructional and evaluation strategies and thereby bringing about a qualitative change in the teaching-learning system of polytechnic education. Academic autonomy will allow the institutes to develop collaboration with industries, with respect to undertaking mutually beneficial projects or training programs. Such endeavors are likely to add to the level of competency of the faculty and ensure better utilization of resources. Collaboration with industries will also improve the relevance of course offerings.

Resource Generation

The World Bank Assisted Projects provided resources for the one-time development of polytechnics. However, in order to continue the process of development it is necessary for these institutes to come up with innovative methods of resource generation such as the acceptance of consultancy projects or renting out of facilities and resources for use by other organizations and the public. This will also result in the optimal utilization of resources.

Collaboration with industry and the development of public-private partnerships will provide ways to overcome resource crunches.

Developing Links with Industry and Organizations

Technical institutions at all levels should establish links with one another as well as with organizations and bodies from whom they receive input flows. The institutions should also have strong links at the national, regional, and state levels with agencies and organizations responsible for policymaking, funding, accreditation, and quality control. The institutions also need to have links with end users of their products. The purpose of these links is to encourage information exchanges, establishment of norms, standards and their implementation, sharing of resources and expertise, provision of vertical and horizontal mobility to students in professional development, optimization of resources by avoiding duplication of efforts and development of policies for the growth and improvement of technical education.

Close links with industry are of utmost importance to the polytechnic education system. To promote quality, cost effectiveness, efficiency, and work culture in technical institutions, it is essential that industry become an equal partner in the training and management of programs by being either a provider or collaborator in developing training programs with a conscious

effort to address industry needs for various categories of technical labor including polytechnics. This will also help in improving the relevance of the course offerings and the mode of delivery, sharing of resources, meeting part of the training cost and expertise for training and management of institutions by industry and reducing the lead time for transfer of research and innovations in the field of engineering and technology to industry.

E. Recent Initiatives in Polytechnic Education

World Bank Assisted Projects

In 1990, the government of India, with the help of the state governments, developed a scheme for financing polytechnic education with the assistance of the World Bank. Investment of the order of more than Rs25,000 million was made in two phases covering almost all the AICTE-recognized polytechnics in the country. Under the schemes, the institutions have initiated projects for: (1) capacity expansion to develop new institutions and programs, (2) quality improvement for modernization and removal of obsolescence, staff development, etc., and (3) efficiency improvement to strengthen the management structures at different levels and establish maintenance cells.

Another project to strengthen and upgrade polytechnics in the six North Eastern states, the union territory of Andaman and Nicobar Islands and Jammu and Kashmir is currently in progress. This is also being implemented with the assistance of the World Bank.

National Policy Initiative in Technician Education

A National Policy Initiative in Technician Education was launched by the government in 1998. The major initiatives recommended under the policy were: shifting decision making to the institutional level; generation of additional resources; developing Centers of Excellence and Indian Polytechnic Institutes; faculty and staff recruitment and development; information resources and services; raising the status of polytechnic graduates; developing NITTTRs as resource institutions for polytechnics.

Professional Development and Academic Support

At present, the NITTTRs have started conducting postgraduate programs leading to master of technical education (M. Tech. Ed.) M.E., M. Tech., and Ph.D. degrees to meet the increased training needs stemming from

modernization and quality enhancement in the polytechnic education system. In addition, the institutes undertake a variety of activities in the areas of development of instructional competence, curriculum development, admission tests and examination reforms, production of instructional resources, laboratory innovations, promotion of educational research, extension services to states, polytechnics, industries, and community and management development. NITTTRs have continuously assessed the needs of the states through surveys, research conferences, and consultation.

The curriculum development activity has contributed to the adoption of systematic approaches to the development of job-related technical programs with the involvement of teachers from polytechnics and other technical institutions as well as professionals from industry. The approach has helped the training of a sizeable number of polytechnic teachers in the process of curriculum design, evaluation and updating of existing courses, interpretation and effective implementation of curriculum specifications, thereby creating the potential for systematic curriculum development.

In the area of instructional material development, NITTTRs have developed a variety of materials both printed and non-printed; printed materials such as textbooks, laboratory manuals, workbooks, data books, etc., and non-printed materials such as videos, computer-assisted learning packages, charts, OHP transparencies, models, slides, film strips, tape-slide programs, experimental boards, teaching kits and multimedia learning packages.

NITTTRs have also involved industries in their activities and promoted interaction between industries and the polytechnics. The promotion of entrepreneurship among polytechnic students is another area where NITTTRs have contributed significantly to promoting self-employment among graduates.

F. Challenges for Polytechnic Education

In view of the recent growth of the Indian economy triggered by the opening to worldwide competition and technological advancements, the requirement has arisen for a large reservoir of highly trained human resources at different levels with the capacity to acquire, utilize, adopt, and improve technologies. The current polytechnic education system in the country is unable to meet the needs of industry effectively because of the existing rigidity in course offerings, instructional methods, evaluation and certification, etc. This rigidity also hampers the responsiveness of the system to changes in technology and results in the subsequent failure to meet the competency requirement

of skilled professionals in industry. The challenges facing the polytechnic education system are:

- *Capacity building in terms of physical and human resources;*
- *Quality improvement of programs and projects;*
- *Introduction of demand-driven and industry-required program;*
- *Increasing the relevance of polytechnic programs to the multi-level requirements of technician labor in the world of work;*
- *Introducing flexibility to the polytechnic education system to facilitate training and re-training of working professionals for upgrading of their skills and knowledge on a continuing basis;*
- *Improving the quality of education and training by inculcating a culture of innovation and research;*
- *Offering modular employable skills program; and*
- *Developing closer links with industry and involving it in the design and implementation of programs, management of institutions and in sharing of resources.*

V. ENGINEERING AND PROFESSIONAL EDUCATION IN INDIA

A. History and Growth

The foundation of engineering and technical education in India was laid before independence through the introduction of license courses in civil engineering by the British rulers with the goal to train personnel to oversee the construction and maintenance of public civil engineering structures. They also introduced training for artisans and craftspeople in the use of the instruments and apparatus needed for the army, navy, and survey department. The first engineering college was established in 1847 for the training of civil engineers at Roorkee. Later, three other engineering colleges were opened around 1856. They still exist and are currently known as the Bengal Engineering College, Poona College of Engineering and Guindy College of Engineering. After 1880, a demand for mechanical and electrical engineers was felt, but the three engineering colleges limited their work to introducing apprenticeship classes in these subjects. The Victoria Jubilee Technical Institute, which was established at Bombay in 1887, had as its objective the training of licencees in electrical, mechanical and textile engineering. Most of these institutes were converted to degree engineering colleges after independence.

In 1915, the Indian Institute of Science, Bangalore, began to offer classes in electrical engineering under Dr. Alfred Hay, and began to give certificates and associateships, the latter being regarded equivalent to a degree.

The National Council of Education was formed in 1907 in Bengal by the leaders of the Swadeshi Movement, which founded the College of Engineering and Technology at Jadavpur. It began granting diplomas in mechanical and civil engineering courses in 1908 and in chemical engineering in 1921.

The University of Banaras first started offering degree classes in mechanical and electrical engineering and metallurgy in 1917. About fifteen years later, the Bengal Engineering College at Sibpur started offering mechanical engineering courses in 1931–32, electrical engineering courses in 1935–36, and courses in metallurgy in 1939–40. Courses in these subjects were also introduced at Guindy and Poona about the same time.

Technical education gained momentum after independence in 1947, when the central and state governments began to emphasize policies for this purpose. Full policy support and substantial funds were provided by the central and state governments to create a system of technical education. In the following six decades, the country witnessed a steady growth of technical education facilities.

The number of degree level engineering institutions increased from 38 in 1947, with an intake capacity of 2,940, to 1,522 institutions in the year 2006–07, with an intake capacity of 508,986 students. Since the 1980s, the private sector has played a major role in expanding capacity in the technical education sub-sector. Approximately two-thirds of engineering colleges and polytechnics are currently run by the private sector. Figure 7 depicts the growth of degree-offering engineering colleges in India over the decade from 1997 to 2007.

Figure 7: Growth of Engineering Colleges in India

Source: Ministry of Human Resource Development, Government of India: http://education.nic.in.
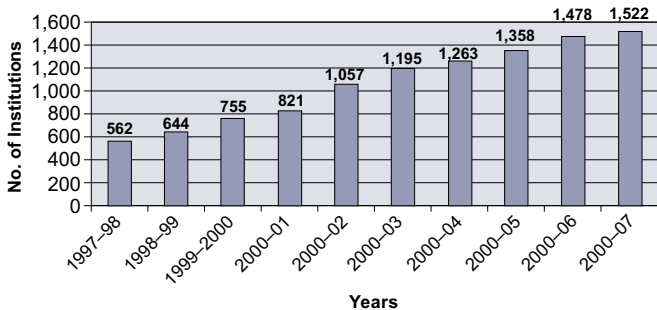
B. Overview of Engineering and Professional Education in India

Presently, at the apex of the technical education system in India one finds the seven Indian Institutes of Technology (IITs) located at Mumbai, Delhi, Kanpur, Kharagpur, Chennai, Guwahati, and Roorkee, whose aim is to impart world-class education. They were established by the central government and are directly funded by it. The Indian Institute of Science, Bangalore was set up to offer postgraduate education and conducts research in various areas of basic science, engineering, and technology. It is yet another world class institution and is directly funded by the Bureau of Technical Education.

Seven Indian Institutes of Management (IIMs), located in Ahmedabad, Bangalore, Calicut, Kolkata, Indore, Lucknow, and Shillong are centers of excellence in management education established by the government with the objective of imparting high quality management education and training, conducting research, and providing consultancy services in the field of management of various sectors of the Indian economy.

Over the years, the Indian government has also established several other institutes for imparting quality education and conducting research in specialized areas, including the Indian Institutes of Information Technology at Allahabad, Indian Institute of Information Technology and Management at Gwalior, National Institute for Training in Industrial Engineering at Bombay, National Institute of Foundry and Forge Technology at Ranchi, Indian School of Mines at Dhanbad, Sant Longowal Institute of Engineering and Technology at Longowal, North Eastern Institute of Science and Technology at Itanagar, School of Planning and Architecture at New Delhi, and National Institutes of Technical Teacher Training and Research (NITTTR) formerly known as Technical Teachers' Training Institutes at Calcutta, Chennai, Bhopal, and Chandigarh.

In addition to these Centers of Excellence, there are 20 National Institutes of Technology (NITs) formerly known as regional engineering colleges, one each in the major states, to meet the growing requirement for trained technical workers. The NITs are joint and cooperative enterprises of the central and respective state governments.

Table 18 and Figure 8 depict the current status of engineering education in different parts of India, showing the existing number of institutions and total intake as of 2004.

Table 18: Status of Engineering Institutes in Different Parts of India as of (2004)

Region	State/Union territory	Engineering	
		No. of Institutions	Intake
Central	1. Madhya Pradesh	61	20,210
	2. Chhattisgarh	14	4,020
	3. Gujarat	37	12,965
	Total	**112**	**37,195**
Eastern	1. Mizoram	1	120
	2. Sikkim	1	525
	3. West Bengal	54	15,477
	4. Tripura	1	180
	5. Meghalaya	1	240
	6. Arunachal Pradesh	1	210
	7. Andaman & Nicobar	–	–

Region	State/Union territory	Engineering	
		No. of Institutions	Intake
	8. Assam	3	750
	9. Manipur	1	115
	10. Nagaland	–	–
	11. Orissa	41	13,014
	12. Jharkhand	10	3,385
	Total	**114**	**34,016**
North	1. Bihar	8	1,905
	2. Uttar Pradesh	89	28,953
	3. Uttranchal	9	1,440
	Total	**106**	**32,298**
North-West	1. Chandigarh	5	800
	2. Haryana	38	12,785
	3. Himachal Pradesh	5	1,260
	4. Jammu & Kashmir	5	1,545
	5. New Delhi	14	4,330
	6. Punjab	45	14,880
	7. Rajasthan	41	15,045
	Total	**153**	**50,645**
South	1. Andhra Pradesh	236	82,970
	2. Pondicherry	6	2,370
	3. Tamil Nadu	254	80,417
	Total	**496**	**165,757**
South-West	1. Karnataka	118	46,375
	2. Kerala	89	24,413
	Total	**207**	**70,788**
West	1. Maharashtra	155	48,250
	2. Goa	3	740
	3. Daman & D,Dadar, N.H.	–	–
	Total	**158**	**48,990**
	Grand Total	**1,346**	**439,689**

Source: All India Council for Technical Education: www.aicte.ernet.in./ApprovInst/engg_2004.doc.

The mushrooming of private engineering colleges, which are in their initial stages of development as fully-established institutions, is responsible for the far higher number of institutions in the southern region compared to the average in the other states. Overall, government institutions are expanding at a slower rate than those of the private providers. There has been a growing concern about the quality of graduates from the private institutions. In this regard, the appropriate authorities need to ensure stricter monitoring and strong adherence to quality standards.

Postgraduate courses in engineering and technology are currently offered in 185 institutions with an annual intake capacity of approximately 16,800. Some of these institutions also offer doctoral programs in engineering, technology and applied sciences.

Figure 8: Regional Distribution of Degree Engineering Institutions and Intake in 2004
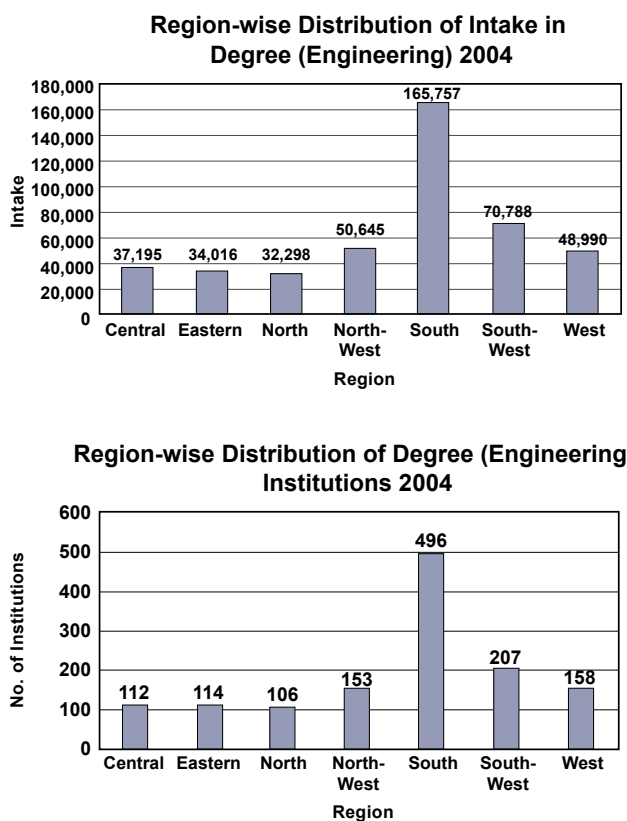
Region-wise Distribution of Intake in Degree (Engineering) 2004

Region-wise Distribution of Degree (Engineering) Institutions 2004

Source: All India Council for Technical Education: www.aicte.ernet.in./ApprovInst/engg_2004.doc

Management and Financing

The management of institutions of higher learning such as universities, engineering colleges, and other professional institutes are carried out by both the central and state levels, with a complex interface between them depending more on convention and precedence than on formal and recognized authority.

University Grants Commission

The University Grants Commission (UGC) has played a major role in the development of technical education as it finances about 32 university departments dealing with higher education in engineering. It is also the authority that recommends "Deemed University"[9] status for an institution to the central government. Its central office is in New Delhi, and it also has a southern regional office in Hyderabad.

An effective mechanism for regulating the functioning of existing state universities is already in place, recognized by the UGC under UGC Act, 1956. In almost all states, the governor is the ex-officio chancellor of the universities located there. In addition, all recognized state universities under the purview of the UGC receive grants and are obligated to follow the statutory regulations established under the UGC Act, which include definitions of the minimum qualifications that should be possessed by any person appointed to the faculties and definitions of the minimum standards of instruction for the granting of a degree by a university.

Under Section 3 of the UGC Act, "deemed to be university" status is granted by the central government to educational institutions of repute, which

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[9] As per the record of the Department of Higher Education, Government of in India, there are more than 109 Deemed Universities in India today. The Central Government of India, which establishes the Central Universities in India, is also entrusted with the responsibility of declaring an educational institution as a Deemed University. The declaration is made on the recommendation of University Grant Commission (UGC) of India. Among other things, the UGC is entrusted with the responsibility of maintaining the standard of higher of education in India. Therefore, an educational institute acquires the status of a Deemed University only after meeting the standard set by the UGC. The UGC may also decide to fund some of these Deemed Universities. The Deemed University status enables the educational institutes to design their own syllabus and course work. They also get the autonomy to set their own guidelines regarding admission and fees. Some of the Deemed Universities are also allowed to grant degrees on their own name. Thus, the Deemed Universities get opportunities to develop their own unique course structure to prepare the students to enter into diverse fields after the completion of their study. Those Deemed Universities that continue to perform well eventually get the status of a full-fledged University (http://www.indiaedu.com/universities/deemed-universities/index.html).

fulfill the prescribed standards and comply with various requirements laid down by the UGC.

The accreditation of institutions of higher learning is overseen by 12 autonomous institutions established by the UGC including the All India Council for Technical Education (AICTE), Distance Education Council, Indian Council of Agricultural Research, Medical Council of India, Pharmacy Council of India, and Bar Council of India.

AICTE was set up in 1945 and was vested with statutory powers in 1987 by an Act of Parliament for performing the functions of planning and coordinating the development of technical education, promotion of qualitative improvement and regulation and maintenance of norms and standards in the various technical institutions under its purview.

AICTE has nine All India Boards of Studies, which advise it on policy planning in their respective areas. The areas are architecture and town planning education, pharmaceutical education, management studies, technician education, postgraduate education and research in engineering, vocational education, undergraduate studies in engineering and technology, hotel management and catering technology, and information technology.

AICTE is comprised of nine bureaus looking after different activities, each headed by an advisor. The Bureau of Technical Education undertakes the processing, funding, monitoring, and evaluation of central institutes, central schemes, and plans for technical education. AICTE also has a National Board of Accreditation as a quality arm for conducting evaluations of technical programs on the basis of prescribed guidelines, norms, and standards.

The establishment of private universities and colleges through State Acts is a recent phenomenon. A regulatory mechanism was laid down by UGC for the maintenance of standards of teaching, research, examination, etc., at these private institutions. A private institution has to meet the minimum criteria in terms of programs, faculty, infrastructure, financial viability, etc., as laid down from time to time by the UGC and other statutory bodies.

Private universities and colleges have to provide all the relevant information relating to the first degree and postgraduate degree/diploma programs including the curriculum structure, contents, teaching and learning process, examination and evaluation system and the eligibility criteria for admission of students, to the UGC prior to starting a program.

Directorates of Technical Education

Most of the state governments have established Directorates of Technical Education to promote the effective administration of technical education. However, the academic control of the state level engineering colleges

rests with the universities to which they are affiliated. Curriculum design, examinations, and the awarding of degrees are the responsibilities of the universities. Each state has a State Board of Technical Education to give proper direction to the development of technical education in that state.

In the case of government engineering colleges, the central government exercises full administrative control and financing. A Board of Governors manages government-aided private institutions with representation from the government. From 90% to 100% of the recurring annual expenditures of aided private institutions are provided by the government.

The IITs act as autonomous universities and are linked through a common IIT Council that oversees their administration. They have a common admission process for undergraduate and postgraduate admissions, and each student needs to qualify in the Joint Entrance Examination for undergraduate admission, and the Graduate Aptitude Test in Engineering (GATE) for post graduate courses. The IIT Council is made up of the Minister in Charge of Technical Education in the central government, the chairman of the University Grants Commission (UGC), the directors of all IITs, the chairman of the Indian Institute of Science (IISc), three members of Parliament, three appointees each of the central government, AICTE and the President of India, who is the visitor of the IITs.

The other Institutes of National Importance such as the Indian Institutes of Management (IIM) and IISc are all governed by similar autonomous bodies.

C. Problems and Issues of Engineering and Professional Education

The sustained and continuous effort of the government of India to expand access to engineering education has led to the expansion and exponential growth of engineering institutions in India. A number of private sector initiatives have become prominent. However, the quality of the graduates from this large number of newly built engineering colleges has become a critical concern. Mutual efforts are needed to improve the quality of the institutions. In this regard, the following problems need to be addressed to overcome the shortcomings under the prevailing conditions in India.

Sharp Variance in Quality between Different Categories of Engineering Institutions

The variance in the quality between the primier institutions and other engineering colleges in India is too significant to be ignored. It has been

suggested that in order to improve the quality of engineering education as a whole, a large number of centers of excellence need to be developed toward achieving the optimum quality required for delivering technical courses. Educational networks need to be encouraged for synergistic development and toward resource sharing within the system.

Links with Industry

Engineering institutions need to further enhance opportunities for developing strong links with industry and communities. These institutions need to direct their efforts to developing close links with industry and communities and to render services to them as a basic instrument of their developmental goals. Higher education, whether general, technical or in any other professional area, must have links with and relevance to all industrial and societal endeavors.

Weak Professional Skills of Engineering Graduates

Companies often find that engineering college graduates have weaknesses in professional practice and generic skills including cognitive skills; interpersonal skills; enterpise, innovation, and creativity skills; and work habits skills. Arrangements for in-service orientation and long-term training are often required to make them professionally useful.

Shortage of Quality Teachers

The large-scale expansion of degree-level institutions, compounded by the weak adherence to prescribed pay schemes in private institutions, has led to an acute shortage of quality teachers particularly in the private engineering institutions. This has resulted in a decline in the quality of education. Teaching jobs could be made more attractive by encouraging strict adherence to prescribed payment and benefit schemes for teachers to encourage the inflow of good faculty.

Implementation of Outdated Curricula

Though there has been rapid growth in the number and total intake of engineering colleges, little change has been made to the curricula of the traditional disciplines. The limited participation of many teachers in the national and international fora, as well as a lack of research activities necessary for updating their knowledge, has compounded the problem.

There is an urgent necessity to upgrade and update the curricula with state-of-the-art technology. Moreover, there is a need to place importance on teacher training programs in the latest technology and new pedagogical skills for smooth implementation of updated curricula.

Declining Interest toward Research and Further Education

Research and postgraduate education in engineering and technology is confined to approximately 200 institutions in India. Nearly 50% of the seats approved for postgraduate education in engineering and technology remain vacant due to early entrance of young workers into the labor market, and therefore fewer potential students to undertake research work. The emergence of new technologies has led to having more young graduates of engineering and technology getting more attracted and absorbed in information technology-oriented industries. Advanced research is therefore becoming weak, and the small annual turnout of Ph.D.s (about 400) appears to be declining. As a result, there is an acute shortage of teachers with postgraduate qualifications, let alone doctorates in engineering and technology.

Compared to 10,000 masters and 800 Ph.D.s given out per year in computer science in the United States, only 300 masters in technology and 25 Ph.D.s in computer science are produced per year in India. For the country to move up the value chain in the IT industry and become a power in knowledge-led business, it must give greater importance to postgraduate education and research. Stressing research and innovation is essential if India wishes to graduate from becoming a mere user of IT to being a generator of IT products and services.

Lack of Monitoring and Accountability

While procedural (financial) audits are mandatory and carried out in minute detail, there is no systematic evaluation of institutional performance. Though reviews of IITs, NITs, NITTTRs, and other state institutions are carried out from time to time, there are no annual performance audits. This reduces the incentive to excel. Feedback systems from lower to higher levels, feedback from students on courses taught, feedback from employers (client system) and evaluations of teacher performance are absent in most institutions.

Feedback systems and performance audits need to be introduced into these institutions of higher learning in order to generate a system of accountability and monitoring in order to acquire and maintain international standards.

Inequity

There are wide variations between states and regions in the development of educational infrastructure. The southern and western states are well ahead, while the eastern and northern states lag.

The disadvantaged groups and vulnerable sections of the society

are poorly represented in institutions of higher learning in spite of the implementation of special efforts such as special coaching, reservation of seats, and award of fellowships and associate ships.

Financing and Resource Generation

Higher education as a whole, including the engineering colleges, is highly subsidized with 90% of operating costs in most public funded/aided institutions coming from the government. The fees charged to students by most public institutions represent no more than a small fraction of the real costs. A resource-generating atmosphere is generally lacking due to stringent rules and regulations.

In the private sector, while a few institutions are utilizing fee earnings and donations to provide high quality professional education, many private institutions are being run on a commercial basis, with significant savings being made by curtailing expenditures even on critical teaching and laboratory inputs.

D. Recent Initiatives in Engineering and Professional Education

In response to the dynamic changes in the world of work, various schemes and programs have been initiated by the government, such as the Technical Education Quality Improvement Programme (TEQIP) assisted by the World Bank, in order to bring about systematic improvements in the engineering education system. The aim of TEQIP is to upgrade and support ongoing government efforts to improve the quality of education at the NITs and other public engineering colleges.

The central government, being conscious of the requirement for quality in the technical education system, has embarked upon several programs to create a catalytic environment for higher education in the country. Expanding centrally funded institutions is one such program, and the facilities available in the institutes such as IITs, NITs, and IIMs are being further consolidated and improved. New institutions are being planned as well. For example, two Indian Institutes of Science, Education and Research have launched academic activities at Pune and Kolkata and plans for a third institute at Mohali, Punjab have been approved. Three new IITs are being set up in the states of Andhra Pradesh, Bihar and Rajasthan. A seventh IIM is being set up at Shillong. In addition, two new schools of planning and architecture and the upgrading of the five NITs to the level of IITs are being actively planned. To enhance the employability of engineering graduates in the IT sector, a new program of

finishing schools[10] is being launched in some select NITs.

Specialized programs such as the National Programme on Earthquake Engineering Education are being implemented with the seven IITs and IISc, Bangalore as resource institutions for training teachers in engineering colleges to develop suitable curriculum for meeting the threat of earthquakes.

To enhance opportunities for research in science and technology and to improve the quality of education, access to electronic journals and databases is being provided to technical institutions through the National Digital Library for Science and Technology (INDEST). With a view to providing the service as cheaply as possible, the AICTE and INDEST have joined hands to form a combined AICTE-INDEST Consortium. To enhance the effectiveness of learning and expand access to high quality education, a National Programme on Technology Enhanced Learning has been launched. It will provide content support in the form of digital video-based courses and enrichment programs on a sustained basis and will also help create web-based courses and programs to enhance the effectiveness of learning in the overall technical education system.

The need for assessment and forecasting to determine futuristic approaches and emerging trends in science and technology was felt by the Ministry of Human Resource and Development, as seen in their Annual Report 1998–99. As an outcome, projects in seven generic areas of strategic significance, namely food processing engineering, integrated design competitive manufacturing, photonic devices and technologies, energy efficient technologies, communication networking and intelligent automation, new materials and genetic engineering and biotechnology are being implemented in mission mode by five IITs and IISc, Bangalore.

The Programme for Building Centres of Excellence in the NITs was initiated during 1993–94 to improve standards of teaching, research and other activities at the NITs. The UK-India Regional Engineering College Project was initiated to strengthen technical education in India through assistance to eight regional engineering colleges (the former name of the NITs) in four technical themes, i.e., design, energy, information technology and materials engineering in April 1994. Through this project, the selected institutions

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[10] With a view to meeting the immediate trained human resource requirements of the IT and ITES, industries, MHRD has taken up an initiative to set up a chain of finishing school programs for engineering graduates with the objectives of (i) offering suitable candidates to the IT industry and (ii) helping young graduates to find jobs by inculcating IT and soft skills components through appropriate training. Usually, programs offer rich inputs to enhance and sharpen the required skills among the engineering graduates and make them employable in the IT and ITES industries (Indian Institute of Technology Roorkee Finishing School Programme for Engineering Graduates: www.ernet.in).

have gained exposure to advanced technologies, and improved teaching methodologies, updated curricula at the undergraduate and graduate levels. Efforts have been made through the project to enhance academia-industry interaction by organizing workshops and seminars involving industries and institutes to improve the quality of the graduates. Library facilities, laboratories, and workshops have been improved.

The IIMs located in Ahmedabad, Kolkata, Bangalore, and Lucknow have established research centers to cater to the needs of non-corporate and under-managed sectors such as energy, health, education, agriculture and rural development.

E. Challenges to the Engineering and Professional Educational System

The Prime Minister, in his speech on Independence Day 2006, said, "Today we are at the dawn of a new millennium which many call the knowledge economy. In this world, knowledge will determine our progress and the place we occupy in the world. We must continue to be at the forefront of new research and new thinking, especially in science and technology..."

India has been promoting engineering education and other professional studies over the last decade. The number of engineering colleges has been growing at 20% per year while business schools have grown at a rate of 60%. The major share of this growth has been in the private sector, in response to the growing demands toward industry.

India produced some 200,000 engineering graduates in 2004–05, and according to AICTE, the total intake in engineering colleges in same year was around 450,000. This compares fairly well to the 600,000 produced each year in the PRC, the largest producer of engineering graduates at present. By contrast, the United States produces only 70,000 engineering graduates every year and all of Europe produces just 100,000. However, at the graduate level, India compares poorly with the United States and other developed nations where higher education and research in engineering is concerned. Currently India produces just 400 Ph.D.s in engineering each year, mostly from the IITs and IISc.

The quantitative increase of engineering graduates has laid the foundation for India's takeoff as a major knowledge power, but the quality of education imparted in most colleges, with the exception of national institutes of importance like the IITs, is in dire need of improvement. According to a McKinsey Global Institute study (2005), only 25% of engineering graduates are employable in multinational organizations.

The demand for IT professionals is increasing tremendously. According to the IT Task Force, the IT industry will reach a level of US$100 billion by 2008, of which US$50 billion will be for software exports, US$30 billion for domestic software consumption and US$20 billion for the hardware sector. To achieve the target, quality workers in the IT field will be crucial. A Ministry of Information Technology report indicated that only 30% of the human resources emerging from the IT supply sector are of sufficient quality to attain high-level skills. Therefore, there is an urgent need to upgrade the quality and training of high-level IT professionals coming out of engineering colleges and university departments.

The rapid growth of private colleges, dominance of commercial interests of private owners, shortage of quality teachers, and declining interest in higher education and research in engineering, all contribute to the current problem of low quality. In view of this, the promotion of R&D efforts and the improvement of the employability of engineering graduates and postgraduates are some of the areas that require concentrated efforts.

The IT market boom in India has led to a corresponding increase in IT education. The majority of courses offered in most private engineering colleges are IT related. Though this is very appropriate under the current market conditions, it is shortsighted in terms of grasping future possibilities in emerging fields. Education in emerging fields such as biotechnology, nanotechnology, and food processing have not yet gained the necessary momentum required to meet future demands.

The challenges currently facing the system of engineering and professional studies in India, therefore, are *improving quality to attain international standards; identifying and developing emerging trends in engineering and technology; encouraging research and development; and gearing higher education to becoming a knowledge power.*

VI. ISSUES, CHALLENGES, AND POLICY DIRECTIONS FOR WORKFORCE DEVELOPMENT

A. Introduction

The globalization of trade and commerce, rapid technological changes, emergence of new technologies, ICT revolution, and the emergence of a knowledge economy are bringing forth new challenges around the world and in India in particular. The goal of meeting the challenges of globalization in India, are however coupled with the goal of reducing poverty and inequality. India currently stands at a development crossroads where balancing the processes of achieving global competitiveness and inclusive development of the workforce has acquired immense importance for sustainable economic growth.

India's favorable demographics, with a relatively young labor force, have often been cited as a key factor contributing to its accelerating growth and as a major strength of the economy in the coming years. However, the Indian labor market today faces an emerging shortage of skilled workers in the face of growing demand in various sectors including the semi-skilled labor-intensive sectors of manufacturing and modern services such as organized retail, civil aviation, and construction. The skill shortage also manifests itself as a problem of retention and attrition in the fast growing knowledge-based industries as well as in social sector services like health and hospitality. This enormous demand for professional education and employable skills cannot be met by the public sector alone, and the entry of private and non-government organizations is essential.

The benefits of India's fast growing economy need to be shared among the majority of the workforce. The informal sector, which absorbs more than 90% of the workforce, poses a major challenge to policymakers, and developing skills there is one of the priority areas of the government. Globalization has created an enormous demand for skilled workers who can meet emerging market needs. People in the informal sector must acquire skill sets with strong labor market links in order to exploit the opportunities created by globalization and acquire productive and gainful employment. Approaching inclusive growth through skill development will require extending the reach of the VET system and improving access to skill training for all (Planning Commission of India 2006).

The role of TVET in workforce development has assumed great importance with the growing demand in the job market for technical and vocational skills. In view of this, restructuring and repositioning TVET has been a major agenda of the 11th Planning Commission of the government of India. It has been noted that the main overall objective of VET in India should be to enhance the employability of the majority of workers by providing vocational competencies required by the labor market. Simultaneously educational reforms must be instituted to create excellence in TVET and to encourage and enable students to gain skills and competencies that accord with globalization.

In the following section, we attempt to identify the current priority issues for workforce development in India, and recommend subsequent policy interventions as cornerstones for action, keeping in mind the changing realities of globalization, competitiveness and the emergence of a knowledge economy on the one hand and the necessity of inclusive growth on the other.

B. Major Challenges and Policy Interventions

The detailed discussions in the previous sections have explored the fact that workforce development in India faces the dual challenges of making people more productive in the informal and rural sectors, thereby enhancing their standard of living, and at the same time developing sufficient numbers of highly trained skilled and knowledge workers to meet the demands of global competitiveness and advance towards a knowledge economy. The interdependence of the education system and the requirements of the labor market cannot be resolved by any single form of action. The following is an attempt to identify the major issues that need to be looked into, analyzed and addressed with necessary policy provisions and interventions to facilitate technical and vocational education and training (TVET) in India for efficient and effective workforce development. Recommendations are based on how they have been successfully implemented in other countries or their potential to address specific issues in conditions prevailing in India. Some recommendations are also intended for introduction of new concepts that needs to be explored to come up with definite implementable results.

The discussions of the previous sections have revealed the major challenges facing the Indian labor market to be acute skill shortages, skill mismatch between demand and supply, low productivity of workers in the informal sector, unemployment and under-employment and a growing demand for knowledge workers in the emerging fields of the economy. The key policy issues in relation to workforce development required for

overcoming the lacunae of the prevailing TVET system and harnessing it to meet the current and future challenges of the world of work efficiently and effectively may be broadly categorized as follows:

Widening the Reach and Accessibility of TVET

The unprecedented economic growth accompanied by widespread urbanization along with foreign direct investment has fueled the demand for skilled workers in India. Severe skill shortages are apparent in the organized and unorganized sectors of the economy. The need for TVET skills is increasing exponentially. Some entrepreneurs have been forced to reconsider their business expansion plans, not because of capital but due to shortage of skills. Considering that the low productivity of the majority of the Indian labor force is the reason behind their meager earnings and subsequent poverty, widening the reach and accessibility of TVET is clearly an imperative for the sustainable and inclusive growth of the country.

The current TVET system in India falls far short in its capacity to incorporate the growing labor force and the diversity of training needs of the changing economy. Out of the 12 million new entrants into the workforce, the ITIs (public and private together) are able to handle only 700,000 and the total training capacity of the current VET system as a whole is around 3 million per year. Hence, the majority of youth remain either untrained or under-trained.

The low preparedness of the vast majority of new entrants into the workforce prevents them from taking advantage of the emerging employment opportunities. Widening the reach of TVET is also imperative as economic growth trends show that much of the employment generation in the last decade has been in the unorganized and informal sector (Planning Commission of India 2007). Skill development for the informal sector, particularly the agricultural sector, requires special attention in order to increase productivity and employability thereby reducing the growing divide between the rich and poor and enhancing inclusive growth.

In recognition of the importance of skill development in both the formal and informal sector, the government of India has announced the establishment of a National Mission on Skill Development. The suggested policy interventions to alleviate the skill shortage currently facing the labor market and at the same time facilitate inclusive growth are: (i) re-orient vocational education and training to incorporate the skill requirements of the informal sector, (ii) develop a National Qualification Framework for the standardization of accreditation and certification; and (iii) encourage private participation in providing training and skill development.

The expected impact and relevance of the suggested policies are enumerated below.

Re-orient TVET to address the Need for Skills in the Informal Sector

TVET in India has so far primarily addressed the need for skills in the organized sector, ignoring the large number of workers in the unorganized and informal sector. With more than 90% of the labor force being absorbed in the informal sector in low productivity jobs, the development of appropriate skills training facilities for this sector is an urgent imperative for enhancing inclusive growth. Employment prospects and the average productivity of unskilled labor are low. Even in rural areas, employment prospects are better for more qualified workers, and the situation is likely to become tougher for the untrained or uneducated workers in the coming years.

Vocational outreach programs for the informal sector have significant weaknesses. They often lack exposure to modern training systems and technologies as well as the innovative aspect of learning. The range of skills tends to be narrow, limited to a particular traditional occupation. In addition, these skills may easily become outdated in the fast-changing labor markets.

Existing public and private training institutes play only a limited role in producing skills for the informal sector. The TVET system in India, which generally caters to the needs of the organized manufacturing sector, has generally neglected the needs of skill development of the unorganized and informal sector. Identifying the skill requirements of the informal sector and facilitating skill development in this sector will be necessary not only for enhancing their productivity and developing an enabling environment for the vulnerable sections of the society, but also for overcoming the skill shortage in the growing sectors of the economy.

Agricultural still being the primary sector in India, special attention needs to be focused on skill development in this sector. Skills pertaining to emerging agro-related industries such as food processing and packaging, agro-forestry, and sericulture need to be expanded. Therefore, skills development for the informal and unorganized sector should be at the center of poverty reduction programs.

Develop a National Qualifications Framework for the Standardization of Skills

The development of a process for upgrading and formalizing existing skills acquired through traditional apprentices is one of the major challenges confronting the vocational education and training system in India. Formalizing existing qualifications or recognition of prior learning

into a National Qualifications Framework (NQF) is now quite common internationally and can help to identify weaknesses in what are often *ad hoc* structures.

There is currently great diversity between the standards of various skill training programs offered by a plethora of government departments and organizations under various ministries. Though the National Trade Tests offered by NCVT constitute a national certification system for the ITIs and ITCs, such a system of centralized certification is virtually absent in the other skills training programs offered primarily for the unorganized and informal sector. The recent initiatives of the DGET and MHRD in this direction cover only their individual responsibilities and do not encompass the issue at the national level.

The development of the NQF needs to be managed by a central authority and it should provide a framework for accrediting providers and for setting procedures for certifying student achievements.

Although improving the quality of informal apprenticeships is not an easy task, there are successful examples based on public-private partnerships. The strategy revolves around the traditional form of training, by upgrading the technical and management skills of the masters as well as their skills in pedagogy. Traditional apprenticeships should be linked with specialized training providers or master craftsmen, with the government acting as a facilitator. Kenya's Jua Kali project where vouchers were distributed to informal sector entrepreneurs to purchase training, provides an example of innovative methods used for skill upgrading (World Bank 2006).

The NQF is also necessary for initiating the process of standardization of accreditation and certification of curricula and evaluation procedures. Greater consistency and cohesion among the many players could be brought about by the establishment of such a framework. The NQF must be based on specified standards of training, leading eventually to the development of industry-relevant modular courses.

Encourage Private Sector Participation in Skill Training

The enormity and complexity of the task of skill development in the informal sector, however, means that it cannot be accomplished by the public sector alone and requires the involvement of private and non-government agencies. The government needs to play the role of trendsetter and facilitator, giving encouragement to private enterprises and NGOs to participate actively in such endeavors. Innovative public-private partnerships, including with NGOs, are needed to meet the diverse skill needs of the informal sector—which involves not only training but also support services such as assistance with running a small business, marketing and information on technology.

One successful approach has been Mexico's Integral Quality and Modernization Program (CIMO). Conditions in Mexico are similar to those in India—99% of firms, which are small- and medium-sized enterprises, employ close to 70% of the workforce. This example shows that partnerships between the public and private sector to provide training and a whole range of support services can be effective in enhancing the productivity of the informal sector. It is very important to emphasize that CIMO has been successful not only because the government facilitates the provision of training to small and medium sized enterprises, but also because enterprises are given assistance with an integrated package of services such as information on how to run a successful business, technology, new production processes, quality control techniques, and marketing (World Bank 2006).

Developing Modular Employable Skills for Both the Formal and Informal Sector

As India's economy continues to grow and the market reorients itself towards newer technologies and emerging fields to maintain global competitiveness, employers are complaining about the increasing difficulty they face in obtaining properly trained employees. With only 5% of workers in the 20–24 year age group having any formal training and only another 8% having acquired some skills informally, it is no wonder that India's labor market faces an acute skill shortage. One of the suggested strategies for overcoming this skill shortage is to focus on: (i) modular employable skills and (ii) entrepreneurial skills. No such system currently exists.

Modular Employable Skills

The concept of modular employable skills (MES) bears particular significance for small scale enterprises and the informal sector, as it involves providing formal skill training to the poor and backward sections of society for whom the length and cost of usual formal training options are impractical due to social and economic constraints.

Many jobs in the current labor market do not require long-term rigorous training, but rather specific skills that may be imparted through short modular courses. The concept of MES embodies the idea of imparting various types of "minimum skills" that enable a person to obtain gainful employment. These courses should be demand driven with curricula responding to market needs. The same applies to many formal courses.

Entrepreneurial Skills

The importance of developing entrepreneurial skills is also increasing as current trends indicate that the majority of the workforce is likely to be absorbed in the un-organized and informal sector in the near future. Therefore, encouraging workers to develop micro and small enterprises or to become self-employed is likely to provide a better option for earning a livelihood than wage labor.

The training required for the development of entrepreneurial skills is often more diverse than that required for wage employment. The breadth of tasks that need to be performed by an entrepreneur or self-employed person includes a variety of functions starting from initial market surveys to cost and quality control, financing, and marketing. In addition to skill development, other types of support such as access to credit, technology, and market information need to be provided by the government as well as the training providers to encourage entrepreneurship.

Developing Demand Driven TVET

The public TVET system is largely supply driven. The supply driven nature of the vocational education and training have often led to programs with limited impact on the labor market. The supply driven nature of the policies of the central government regarding vocational education and training have often led to the creation of departments or organizations, appointment of people, building of infrastructure and conduction of training, but there has been a limited impact on the economy.

The apparent divorce of the TVET system from the market, which is also marked by the current mismatch between the skills taught and those actually in demand, is attributable to the general disconnect between TVET and industry and the supply-driven nature of government policies regarding VET. To overcome the skill mismatches that are often reported by employers and to make TVET more market oriented, the government needs to adopt a demand-driven policy backed by key strategies such as: (i) developing and upgrading a manpower information database; (ii) developing public-private partnerships and maintaining close interactions with industry; and (iii) competency-based training.

The relevance of these policies and strategies are as follows:

Demand Driven Policy

A demand-driven policy would signal a change in the way in which the subject is addressed and would likely offer courses and programs according

to the needs of the market. This would indicate that the government's focus has shifted from a supply-driven stance to identifying the skill requirements and demands of the industry and other stakeholders and taking necessary measures to develop such skills.

The Task Force on Skill Development constituted by the 11th Planning Commission recommended a shift from a supply-driven to a demand-driven policy regarding skill development.

Developing and Upgrading a Manpower Information Database

There is an urgent need for technical labor spectrum studies and the development of a scientific database for technical labor assessment. The National Technical Manpower Information System and its nodes could be strengthened to take on this job on a continuous basis. The availability of such studies and developing a database containing both numbers and job profiles to the policymakers and other stakeholders of the TVET system would facilitate the process of comprehensive planning and prevent mismatches between the skills taught in TVET institutions and those required in the world of work.

Labor spectrum studies could provide data for the development of trained workers in frontier areas, assist in improving and updating the curricula of institutions and help to integrate development in these areas, allowing knowledge and technological skills in these areas to be developed over a wide spectrum of the workforce base, from artisans to research scientists.

A feedback system from students, employers, and other stakeholders to the National Technical Manpower Information System needs to be developed as well, to allow the periodical updating and improvement of the technical labor assessment procedures and tools.

Developing Public Private Partnership Models

Until recently, there was limited participation by employers in defining training policies and developing courses. The creation of public-private partnerships, not only at the national and state levels, but also with close involvement of employers at the local and institutional levels, would contribute to developing closer links between industry and TVET thereby facilitating the process of quick response to changing needs in the world of work. Involving employers at the institutional level should be a key management objective. Greater autonomy at the institutional level, accompanied by an accountability framework, however, needs to be granted to obtain positive results from public-private partnerships.

In accordance with the concept of public-private partnerships, Institutional Managing Committees (IMCs) for ITIs were introduced by

DGET in 1998. The committees are chaired by a local industry representative and supported by the Confederation of Indian Industry and the Federation of Indian Chamber of Commerce and Industry.

UNESCO suggested that public-private partnerships in TVET can take several forms, including but not limited to: (1) piloting new initiatives; (2) training partnerships; (3) sectoral partnerships; and (4) system-wide partnerships (Japan International Cooperation Agency [JICA] 2006). Variance in the level of partnership between the state and private industry (i.e., structured, flexible, voluntary, and unstructured) can also be taken into consideration in formulating relevant government policies to meet the partnership requirements for TVET.

Policy provisions in line with the development of public-private partnerships can facilitate natural synergy among stakeholders and therefore encourage the stream of cooperation in TVET.

Competency-Based Training

The large number of the unemployed in the country consists of educated youths without employable skills. This indicates the necessity of placing stress on competency-based learning. In addition to generic learning, the curricula of both academic and vocational courses need to be designed to provide opportunities for developing specific or multiple competencies in their students so that they are better equipped for the world of work. Modular, competency-based courses also provide better opportunities for the upgrading of competencies and skills for those already employed and thereby facilitate the process of continuing education and life-long learning.

Strengthening Capacity Building in Both Infrastructure and Human Resource Development for Emerging Technology

One of the significant challenges for TVET in India is the limited infrastructure in most institutions and a lack of competent faculty and trainers for emerging technology. This problem is amplified in the public TVET system due to the paucity of public investment. Outdated infrastructure and poor laboratory facilities are a hindrance to modern training.

The World Bank Assisted Project on transforming 400 ITIs into Centers of Excellence aims at capacity building in both infrastructure and resource development. These projects are expected to have an impact on improving teacher education, personnel training and curriculum development.

These efforts need to be translated in policies that lead to resource generation, staff development and capacity building. Suggested policies for

these purposes are (i) resource generation; (ii) training of trainers; and (iii) building Centers of Excellence. The proposed policies are relevant in the following ways.

Resource Generation

The public training system is still an important provider and financier of pre-employment training in India, with courses at public training institutes provided for free or at nominal fees. This simple financing framework has become inadequate to meet the skill development needs of a rapidly globalizing economy and it has become important to consider greater cost-sharing with beneficiaries as well as to consider how to encourage provision of training by the private sector. Increasingly, limited public sector budgets have constrained the ability of the states to provide adequate and stable funding to the public training sector.

The weak financing of training in the public sector has a significant impact on the forging of tie-ups and partnerships with the private sector. Asian Development Bank (2004) summarized the role of government in promoting an enabling environment for private training markets to work. The report added that non-government trainers are a significant part of the VET sector, bringing opportunities for private investment into training, broadening access, and reducing pressure on public spending for skill development. Innovative means of resource generation through public-private partnerships, joint ventures with industry, and other means, need to be encouraged at the institutional level, and this will require more autonomy.

Extreme care is required in considering the general method of increasing training fees as a means to generate resources for VET courses in India. Though for the present, students pay fees that amount to less than 5% of the course costs, realistic fees would shut out those who are unable to pay, namely the poor, minorities, and rural populations. There is a need to come up with innovative financing schemes such as levy systems, employment vouchers, skills development funds, employment insurance and educational bank loan systems.

Training of Trainers/Instructors/Teachers

The quality of teachers, trainers, and instructors has a direct impact on the quality of output of any educational or training institute. A shortage of high-quality teachers and trainers is a common feature of all types of TVET institutions in India. The near total absence of career development opportunities poses an obstacle for retaining high-quality teachers and trainers in TVET. The lack of teacher/trainer training adds to the woes. Training

teachers and instructors assumes additional significance in view of the rapid technological changes taking place today and India's entrance into the global market.

Developing Opportunities for Both Horizontal and Vertical Mobility in TVET

A distinct compartmentalization can be seen between the three levels of technical education in India. Vocational education and training is a dead end, with no scope for vertical mobility. Rigid course curricula structure and institutional frameworks do not provide flexibility towards multiple entry facilities or multi-skilling, and thus obstruct horizontal mobility in polytechnics as well as VET.

The introduction of short, credit-based, modular competency-based courses could provide increased flexibility to the VET system, thereby allowing students of vocational and technical courses to move horizontally between courses, acquiring cluster of skills.

Various models and pathways have been utilized by different countries to provide opportunities for vertical mobility to TVET graduates towards higher learning. Flexibility in institutional frameworks and a reduction of compartmentalization between different types of institution may be a first step towards finding such a path. While learning from international experience, India will have to forge a framework unique to its own requirements.

Policies that do not limit higher learning and the assimilation of specialized skills in specific occupational areas will create new paradigms for TVET development. The accreditation schemes in Australia's vocational education system (technical and further education) might help in providing insights regarding methods that can be adopted to allow maximum flexibility to students in moving between different education systems.

Developing Knowledge Workers with Cognitive and Manual Skills

Though the performance of IT and ICT professionals has contributed to increasing India's visibility in the international arena, the TVET sector in general lacks the orientation required to produce quality knowledge workers in every field of work.

The paradigm shift in pedagogy and the teaching-learning processes necessary for developing cognitive and analytical skills, promoting life-long learning abilities, and imparting learning of skills need to be pursued in the course of improvements to the present education system.

India's future lies in moving toward a knowledge economy as it becomes an integral part of the global economy. Each individual acts as an agent of change in a knowledge-based society, creating and adding value at his or her own position. Hence, through the inclusion of a TVET system, India's education system needs to produce workers capable of analyzing, planning, investigating, interpreting, and collaborating in all processes of an organization. Therefore, in order to meet the needs of society, individuals and organizations involved in TVET need to equip themselves with effective knowledge management in addition to cognitive and manual skills.

The demand for lifelong learning is rising to respond to rapid globalization and technological changes. A working document presented at a United Nations Educational, Scientific and Cultural Organization (UNESCO)/ Korean Research Institute for Vocational Education and Training policy seminar affirmed the need for increased funding for education and training, new attitudes and values, new teaching methods, and new forms of control in the context of strengthening lifelong learning.

Placing TVET under an Umbrella Ministry

Today, vocational education and training in India falls under 17 ministries. Inter-ministerial coordination is relatively weak, often resulting in fragmented implementation of policy and strategy development, divergent provisions of training, and the dissipation of resources. A number of line ministries and departments as well as statutory institutions have been given redundant powers and functions related to VET. Overlaps in areas of planning, programs, activities and resources also happen due to the current multi-sectoral form of management.

Placing TVET under one umbrella ministry would facilitate the harmonized functioning of various institutions in charge of skill development programs, worker training, as well as the standardization of qualification and skill recognition processes.

The Philippine model is a good example where in 1994 the government created a national agency, the Technical Education and Skills Development Authority (TESDA), to take charge of the skill development and worker training functions of all major educational institutions. An integrated institutional framework is being carried out under one umbrella ministry, which functions to integrate, coordinate and monitor skill development programs; restructure efforts to promote and develop middle-level workers; approve skills standards and tests; develop an accreditation system for institutions involved in middle-level worker development; fund programs and

projects for technical education and skill development, and assist training of trainers programs.

The placement of vocational education and training under a single authority has proven helpful in Australia, Republic of Korea, Sri Lanka and many other countries in bringing about better coordination among the TVET providers and also in comprehensive planning.

Changing the Role of Government from the Main Service Provider to Standard Setter, Coordinator and Facilitator

Up until now, the government has been the major provider of vocational education and training in India. However, it will not be possible to meet the enormous demand for professional and employable skills in the new millennium through the public sector alone, and the entry of private enterprises and non-government organizations will be essential. A preoccupation with the provision and funding of training has resulted in negligence by the government of its key role of maintaining and upgrading the effectiveness of the TVET system.

Instead of being the sole service provider, the government needs to focus on creating an environment to support non-public providers by: (i) establishing a policy framework (regulations and incentives); (ii) supporting curriculum development, training of trainers, and competency-based skills testing; (iii) stimulating investments by private enterprises in TVET through various measures such as tax incentives and financial support to increase the capacity and quality of training; and (iv) revising outdated apprenticeship acts that contain regulations that hamper enterprise-based training.

No government today can afford to provide and finance all the skills needed by a modern economy. The highest priority for government is to facilitate skills development by encouraging each of the partners to pursue its comparative advantage in a market context. The government however needs to take an active role to promote equity in access and can use its financing in a targeted fashion to achieve this goal in state-sponsored skills training for the disadvantaged and vulnerable sections of the society.

The changing role of the government from main service providers to policymaker, standard setter, coordinator and facilitator, and in allowing and encouraging private sector and NGOs to act as training providers, will likely engender greater competitiveness and facilitate the process of expanding accessibility to TVET.

Establishing Regional Accreditation and Certification

Disparities in skills standards and recognition of qualifications pose a major challenge in workforce mobility. India, as a country with various VET providers and institutions with different levels of quality systems and qualifications frameworks, is facing serious challenges of achieving harmonized skills standards to ensure greater mobility of the Indian workforce. Glaring evidence of the lack of mobility accompanies the opening of the labor markets.

Robust skill accreditation and certification is required to ensure mobility and complement the efforts of vocational institutions to produce skilled graduates every year. Partnerships with the private sector would be an excellent provision to make this happen.

In addition, there is a need to support regional efforts and implement a standardized vocational qualifications framework across the Asia Pacific region to achieve mutual recognition of skills and qualifications by training institutions, industries, and countries.

Uplifting the Image of TVET

TVET in India is often seen as second-class education and as the last recourse for those who are unable to succeed in academic learning. In India, occupational education and training has a negative association with manual labor, leading to lack of societal recognition. Aspirations toward higher education and "white collar jobs" and the low perception of vocational education and training make TVET attractive only for low academic achievers and for students from low-income families.

Some strategies for raising the status of TVET include: (i) conducting programs to create awareness and change in people's minds; (ii) promoting TVET as a career path with upward mobility; (iii) promoting the potential benefit of TVET as a pathway to work and tertiary studies; and (iv) encouraging TVET courses for both genders (National Institute for Educational Policy Research 2007).

In addition to the negative association of TVET with blue-collar jobs, the existence of a significant gap between skills demanded by industry and those supplied by training providers render the system ineffective in leading to gainful employment thereby compounding its unattractiveness. In order to improve the image of TVET, the need for capacity building—in terms of both infrastructure and human resources—has become ever more important.

VII. CONCLUSION

The rapid development of India's economy has brought forth new challenges for workforce development. Workforce development in India confronts the changing realities of globalization and competitiveness, on the one hand and the need for inclusive growth on the other. Despite its booming economic growth and huge population, India is suffering from a big shortage of skills.

India's transition to a knowledge-based economy will require a new generation of educated and skilled people. Its competitive edge will be determined by its people's ability to create, share and use knowledge effectively. In order to transform itself into a knowledge economy, India needs to develop knowledge workers with flexibility and analytical powers; these workers can be the driving force for innovation and growth.

The low literacy rate and lack of skill training of the vast majority of the Indian populace poses a major hurdle in its journey towards a knowledge economy. Policies to ensure high-quality education and the expansion of vocational education and skill training for the poor and underprivileged will mark the beginning of this journey. This will enable them to become active contributors in the process of India's economic growth.

Attuning the education system as a whole and TVET in particular to the new global environment by promoting flexibility, creativity and lifelong learning opportunities and attaining excellence in all levels of institutions are therefore the basic requirements for maintaining high levels of productivity of the workforce, which is itself a prerequisite for competitiveness in a highly competitive global market.

Repositioning TVET to achieve the simultaneous tasks of building Centers of Excellence for developing high-quality skilled workers and knowledge workers and at the same time facilitating the process of encompassing the unorganized and informal sector within its folds therefore have assumed great importance in the process of India's workforce development.

India's future lies in a knowledge economy, which may be brought about by harnessing the youth of the country with proper skills, competencies, and knowledge.

APPENDIX I.
LIST OF SECTORS FOR WHICH CURRICULUM DEVELOPMENT UNDER MODULAR EMPLOYABLE SKILLS HAS BEEN TAKEN UP

SI No.	SECTOR
1	Khadi
2	Agriculture machinery
3	Electronics
4	Process instrumentation
5	Hotel and catering
6	Electrical
7	Production
8	Fabrication
9	Chemical
10	Automotive repair
11	Apparel/garment making
12	Information technology
13	Jute & bamboo
14	Ref. & AC
15	Construction
16	Food processing
17	Printing
18	Civil aviation
19	Beauty culture, hair and skin care
20	Plastic processing operator
21	Painting
22	Handicrafts and carpet
23	Leather and sports goods

Source: Eleventh Planning Commission, Government of India, 2006.

LIST OF MODULAR EMPLOYABLE SKILLS COURSE CURRICULA APPROVED BY NATIONAL COUNCIL FOR VOCATIONAL TRAINING
(as of 8 November 2006)

Fabrication

1. Basic welding (gas)
2. Basic welding (arc)
3. Gas cutting
4. TIG welding
5. MAG/CO2 welding
6. Fabrication welding
7. Pipe welding (TIG & ARC)

Electronics

8. Basic electronics (Repair & maintenance of power supply, inverters and UPS
9. Installation & maintenance of DTH system
10. Digital videography editing and mixing
11. Repair & maintenance of washing machine and microwave oven
12. Repair & maintenance of TV receiver
13. Maintenance & repair of electronic test equipment
14. Repair & maintenance of cellular phone
15. Repair & maintenance of intercom system
16. Installation & maintenance of electronic equipments in cell phone towers
17. Repair & maintenance PA & audio systems
18. Repair & maintenance photocopier and fax machine
19. Operation of clinical equipment
20. Operation of ECG & ICCU instruments
21. Maintenance of ECG & ICCU equipment
22. Operation of X-ray machine & darkroom assistance
23. Maintenance of X-ray machine
24. Operation of physiotherapy equipment
25. Maintenance of physiotherapy equipment

Process Instrumentation

26. Instrumentation panel fabrication and installation of pipe line

27. Process instrumentation machinery and equipment mechanic
28. Maintenance of recorders, transmitters and analyzers

Refrigeration & Air-conditioning

29. Basic refrigeration & air conditioning
30. Repair & maintenance of refrigeration unit
31. Repair & maintenance of domestic air conditioner
32. Repair & maintenance of air condition plant
33. Repair & maintenance of MAC unit (car)

Automobile

34. Basic automotive servicing (4 wheelers)
35. Basic automotive servicing (2–3 wheelers)
36. R&O of 2 wheelers (moped)
37. R&O of 2 wheelers (scooter)
38. R&O of 2 wheelers (motor cycle)
39. R&O of 3 wheelers
40. R&O of engine systems (petrol/diesel)
41. R&O of chassis system (light vehicle)
42. R&O of chassis system (heavy vehicle)
43. R&O of auto electrical & electronic system

Chemical

44. Safety & general awareness in chemical industry
45. Process attendant chemical plant
46. Mechanical operation attendant in chemical plant
47. Maintenance attendant chemical plant
48. Instrument attendant chemical plant
49. Lab attendant (chemical plant)
50. Industrial chemical manufacturing attendant
51. Heat transfer equipment attendant (chemical plant)
52. Mass transfer equipment operator – I
53. Mass transfer equipment operator – II
54. Maintenance of pumps & valves (chemical plant)
55. Industrial chemical manufacturing assistant
56. Maintenance & repairs of pressure, flow, temperature and level instruments

57. Advance instrumentation & control attendant

Garment Making

58. Hand embroider
59. Machine embroidery operator
60. Garment packer
61. Garment Ironer
62. Maintenance of machines in garment sectors
63. Basic sewing operator
64. Computerized embroidery machine operator
65. Garment cutter
66. Garment checkers
67. Skilled sewing operators
68. Special sewing machine operator
69. Tailor children
70. Tailor ladies
71. Tailor gent's
72. Tailor suits

Production and Manufacturing Matrix

73. Turning
74. Advance turning
75. CNC turning
76. Milling
77. Advance milling
78. CNC milling
79. Surface grinding
80. Cylindrical grinding

Plastic Processing

81. Basic fitting & measurement
82. Basic electrical joints & fitting
83. Plastic mold assistant for injection molding
84. Plastic mold assistant for compression molding
85. Plastic mold assistant for extrusion molding
86. Plastic mold assistant for blow molding
87. Auto plastic mold assistant (injection molding)

88. Auto plastic mold assistant (compression molding)
89. Auto plastic mold assistant (extrusion molding)
90. Auto plastic mold assistant (blow molding)

Printing

91. Basic for printing sector (except book binding)
92. Basic book binding
93. Offset machine operator – sheet fed (single & multi color)
94. Offset machine operator – (web perfector)
95. Offset plate maker
96. DTPO
97. Screening printing
98. Book binder
99. Advanced/supervisory (except book binding)
100. Advanced/supervisory (book binding)

Electrical

101. Basic electrical training
102. Repair of home appliance
103. House wiring
104. Electronic choke & CFL assembling
105. Transformer winding
106. Armature winding
107. Rewinding of AC/DC motors
108. Repair of electrical power tools
109. Maintenance of batteries

Khadi Spinning & Weaving Sector

110. Spinning on new model charkha
111. Advance spinning (woolen)
112. Advance spinning (cotton & muslin)
113. Advance spinning (silk)
114. Plain weaving on frame loom
115. Advance weaving (woolen)
116. Advance weaving (silk)
117. Advance weaving (cotton/polyvastra)
118. Advance weaving (kanchivaram/banarasi)

APPENDIX III.
APPRENTICESHIP TRAINING SCHEME

Objective
The Apprentices Act, 1961 was enacted with the following objectives:

- To regulate the program of training of apprentices in industry so as to conform to the prescribed syllabi, period of training etc. as laid down by the Central Apprenticeship Council; and

- To fully utilize the facilities available in industry for imparting practical training with a view to meeting the requirements of skilled labor for industry.

Evolution of the Apprentices Act 1961

- National Apprenticeship Scheme started in 1959 on a voluntary basis.

- The Apprenticeship Act was enacted in 1961 and implemented in 1962 making it enforceable.

- Initially, the Act envisaged the training of trade apprentices.

- The Act was amended in 1973 to include the training of graduate and diploma engineers as "graduate" and "technician" apprentices.

- The Act was further amended in 1986 to bring within its purview the training of the 10+2 vocational stream as "technician (vocational)" apprentices.

- The Act was again amended in 1997 to amend various sections of the Act as regards the definition of "establishment" and "worker," termination of apprenticeship contract, number of apprentices for a designated trade, practical and basic training of apprentices, obligation of employers, penalty for contravening the provisions of the Act, and cognizance of offences.

Categories of Apprentices
There are four categories:

  i. Trade apprentices
 ii. Graduate apprentices
iii. Technician apprentices
 iv. Technician (vocational) apprentices

**Monitoring Mechanism**

For Trade Apprentices

Central government departments undertakings	:	Union Ministry of Labour and public sector employment through six Regional Directorates of Apprenticeship Training located at Chennai, Faridabad, Hyderabad, Kanpur, Kolkata, and Mumbai
State government departments and public sector undertakings & private sector establishments	:	State/union territory governments

For Graduate Technician and Technician (Vocational) Apprentices

All establishments	:	Union Ministry of HRD through four Regional Boards of Apprenticeship Training located at Chennai, Kanpur, Kolkata, and Mumbai

Trade Apprentices

Number of establishments	:	20,800
Number of trades	:	153
Period of training	:	6 months to 4 years for freshers. Rebate in period of training for ITI for ITI graduates in relevant trade.
Educational qualification	:	8th pass to B.Sc.

Graduate & Technician Apprentices

Number of subject fields	:	104
Period of training	:	One year

Technician (Vocational) Apprentices

Number of subject fields	:	97
Period of training	:	One year

Technician (Vocational) Apprentices

Number of subject fields   : 97
Period of training   : One year

Training Statistics

Category of Apprentices	Seats Located	Seats Utilized	% of utilization
Trade	255,990	186,122	73%
Graduate, technician, technician (vocational)	87,011	39,405	45%

Rates of Stipend

Trade Apprentices

First year   : Rs1,090 p.m.
Second year   : Rs1,240 p.m.
Third year   : Rs1,440 p.m.
Fourth year   : Rs1,620 p.m.

List of Designated Trades under the Apprentices Act

Trades having entry qualification class 8th pass

Names of trades		Period of training
Lineman	Wireman	3 years
Furniture & cabinet maker	Plumber	
Mechanic (marine diesel)	Tractor mechanic	
Pattern maker	Painter general	
Driver-cum-fitter		
Mason (building constructor)	Sports good maker (wood)	2 years
Auto mechanic (two wheeler/ three wheeler)	Book binder	
Tailor (general)	Leather goods maker	
Footwear maker	Finished leather maker	
Upholsterer	Rigger	
Gas cutter	Ceramic molder	
Ceramic caster	Ceramic kiln operator	
Ceramic press operator	Ceramic decorator	
Molder (refractory)	Painter marine	
Tailor (men)	Tailor (general)	1 ½ years
Jewelry and precious metal worker		1 year
Weaver	Doffer-cum-piecer	6 months
Tenter (drawing speed/fly frames)	Winder (textile)	

Names of trades		Period of training
Printing textile	Barber/hair cutter/dresser	6 months
Type repairer	Pruner tea gardens	
Trades having entry qualification class 10th pass		
Electrician aircraft	Tool & die maker (die & mold)	4 years
Tool & die maker (press tools, gigs & fixture)	Mechanic (earth moving machinery)	
Mechanic (instrument aircraft)	Power electrician	
Plastic mold maker	Mechanic radio and radar aircraft	
Operator cum mechanic (power plant)		
Trades having entry qualification class 10th pass		
Fitter	Turner	3 years
Machinist	Machinist (grinder)	
Foundryman	Forger & heat treater	
Sheet metal worker	Electrician	
Mechanic machine tool maintenance	Mechanic maintenance (textile machinery)	
Shipwright (steel)	Mechanic (dairy maintenance)	
Mechanic maintenance (chemical plant)	Material handling equipment-cum-operator	
Instrument mechanic	Mechanic watch and clock	
Mechanic diesel	Mechanic (motor vehicle)	
Refrigeration and air conditioning mechanic	Construction machinery mechanic-cum-operator	
Draughtsman (civil)	Draughtsman (mechanical)	
Surveyor	Fitter structural	
Boiler attendant	Mechanic mining machinery	
Switch board attendant	Lino operator	
Mono keyboard operator	Process cameraman	
Retoucher Lithographic	Engraver	
Offset machine minder	Optical worker	
Sirdar (colliery)	Mate (mines)	
* Attendant operator (chemical plant)	* Instrument mechanic (chemical plant)	
* Laboratory assistant (chemical plant)	Mechanic (agriculture machinery)	
Maintenance mechanic for leather machinery	Insulator maker/machine operator (ceramic)	
Pipe fitter	Shipwright (wood)	
Electronics mechanic	Brick layer (refractory)	
Apprentices food production (general)	Steam turbine cum auxiliary plan operator	
Winder (armature)	Cable jointer	
Electrician (mines)	Electroplater	

Names of trades		Period of training
Carpenter	Mechanic television (video)	3 years
Attendant operator (dairy)		

* Trainees previously possessing B.Sc. qualification can undergo apprenticeship training with duration of 1 ½ years in these trades.

Trades having entry qualification class 10th pass		
Welder (gas & electric)	Motor vehicle body builder	2 years
Auto electrician	Mono castor operator	
Plate maker (lithographic)	Shortfirer/blaster (mines)	
Steward	Baker and confectionery	
Hotel clerk/receptionist/front office assistant	Apprentice food production (vegetarian)	
Fiber reinforced plastic processor	Plastic process operator	
Designer and master cutter	Dress maker	
Embroidery and needle worker	Horticulture assistant	
Stockman (dairy)	Pump operator cum mechanic	
Sports goods maker (leather)	Photographer	
Beautician	Steel melting hand	
Crane operator (overhead steel industry)	Furnace operator (steel industry)	
Hair dresser	Health and slimming assistant	
Cosmetologist	Enamel glazer	
Fruit and vegetable process		
Housekeeper	Knitter (hosiery)	1 ½ years
Mechanic sewing machine	Gardener	1 year
Battery repairer		
Creel boy-cum-warper	Screen printing	6 months
Beautician assistant	Cable television operator	
* Call center assistant		
Trades having entry qualification class 12th pass		
Operator advanced machine tool maintenance	Mechanic advanced machine tool maintenance	3 years
Mechanic industrial electronics		
Data preparation and computer software	Desk top publishing operator	2 years
Operator cum mechanic pollution control equipment	Mechanic medical equipment for hospitals and occupational health center	
Medical laboratory technician (pathology)	Medical laboratory technician (radiology)	6 months
Medical laboratory technician (cardiology and physiology)		
Trades having entry qualification B.Sc. pass		
Advanced attendant operator (process)		1 ½ years

Trades having entry qualification National Trade Certificate in "Computer Operator and Programming Assistant" issued by National Council for Vocational Training		
Programming and systems administration assistant		1 year

* Persons possessing National Trade Certificate issued by NCVT in the trades of electronics, mechanic, electrician, mechanic cum operator electronics communication system, computer operator and programming assistant, information technology and electronics system maintenance, radio and television, instrument mechanic can undergo apprenticeship training.

Subject fields in engineering and technology designated for graduate/diploma apprentices	
1. Civil engineering	2. Public health engineering
3. Structural engineering	4. Highway engineering
5. Construction technology	6. Mechanical engineering
7. Refrigeration and air-conditioning	8. Machine tool technology
9. Production engineering	10. Automobile engineering
11. Electrical engineering	12. Electronics and telecommunication engineering
13. Computer engineering	14. Television engineering
15. Industrial electronics	16. Radio & electronics engineering
17. Nuclear engineering	18. Avionics
19. Metallurgy	20. Textile engineering
21. Agricultural engineering	22. Chemical engineering
23. Sugar technology	24. Marine engineering
25. Nautical engineering	26. Aeronautical engineering
27. Mining	28. Plastic technology
29. Textile chemistry	30. Naval architecture
31. Architecture	32. Regional and town planning
33. Textile technology	34. Glass technology
35. Ceramic technology	36. Silicate technology
37. Pharmaceutical science	38. Oil and soap technology
39. Pigment and paint technology	40. Dye stuff technology
41. Printing technology	42. Leather technology
43. Leather goods and footwear manufacture	44. Rubber technology
45. Food technology	46. Bio-chemical engineering
47. Instrumentation technology	48. Petroleum engineering
49. Petroleum technology	50. Applied geology
51. Applied geophysics	52. Jute technology
53. Paper technology	54. Catering technology
55. Plastic engineering	56. Foundry technology
57. Sound engineering	58. Ground water engineering
59. Drilling engineering	60. Cinematography
61. Fisheries and navigation	62. Medical laboratory technology
63. Industrial engineering	64. Knitting technology
65. Secretarial commercial practice	66. Interior decoration

67. Library science	68. Costumes design & dress making/ garment technology
69. Fine art sculpture commercial, etc.	70. Computer science/computer applications
71. Polymer technology	72. Dairy engineering technology
73. Mining machine engineering	74. Mineral engineering
75. Fabrication technology	76. Transportation engineering
77. Wood/timber technology	78. Safety engineering
79. Handloom technology	80. Plant engineering technology
81. Ship building technology	82. Man-made fiber technology
83. Tool engineering technology	84. Bio-medical engineering
85. Energy engineering	86. Production engineering and industrial management
87. Architectural assistantship	88. Electrical and electronics engineering
89. Environment pollution and control engineering	90. Footwear technology
91. Computer aided design, computer aided manufacturing/ROBOTICS application	92. Bio-gas technology
93. Petro-chemical engineering/ technology	94. Water management
95. Water resource engineering	96. Machine tools and maintenance
97. Industrial electronics and instrumentation	98. Aircraft maintenance engineering
99. Mechatronics	100. Cement technology
101. Information technology	102. Materials management
103. Packaging technology	104. Beauty culture and cosmetology

References

All India Consultation Meeting on Vocational Education and Training. 2007. Setting Directions and Strategies for XI Five Year Plan, PSS Central Institute of Vocational Education, March.

Asian Development Bank (ADB). 2006. Annual Report. Available: http://www.adb.org/Documents/Reports/Annual_Report/2006/default.asp.

ADB. 2005. *Key Indicators of Developing Asian and Pacific Countries*. Available: http://www.adb.org/documents/books/key_indicators/2005/pdf/special-chapter-2005.pdf.

ADB. 2004. Improving Technical and Vocational Education and Training Strategies for Asia, ADB. Manila.

Bax et al. 2003. *Lifelong learning in Malaysia*. Working paper for the International Policy Seminar On Making Lifelong Learning a Reality by IIEP/UNESCO and KRIVET, Seoul, Republic of Korea, 24–26 June.

Directorate General of Employment and Training, Ministry of Human Resource Development, Government of India. Annual Report 1999–2000. Available: http://dget.nic.in/dex/empscenario.pdf.

Eleventh Planning Commission, Government of India. 2006. *Report of Working Group on Skill Development and Vocational Training*.

Japan International Cooperation Agency (JICA). 2006. *Lessons from TVET Projects Supported by the Japanese Government and Recommendations for the TVET Policies of BMENA Countries from the Public-Private Partnership (PPP) Perspective*. TVET Working Group of the G8-BMENA Partnership Initiative.

Ministry of Labour, Government of India. Annual Report 2006–2007. Available: http://labour.nic.in/annrep/annrep2006.htm.

NASSCOM-McKinsey Report. 2005. Available: http://www/mckinsey.com/locations/india/mckinseyonindia/pdf/NASSCOM_McKinsey_Report_2005.pdf.

National Institute for Educational Policy Research. 2007. *From School to Work: Contemporary TVET Regional Experiences- Final Report of the Seminar*. Tokyo.

National Sample Survey Organization (NSSO). 2004. 61st round of survey. Available: http://mospi.nic.in/mospi_nsso_rept_pubn.htm.

Planning Commission of India. 2006. An Approach to the 11th Five Year Plan, Towards Faster and more Inclusive Growth. December. Available: http://planningcommission.nic.in/plans/planrel/app11_16jan.pdf.

Secretary's Commission on Achieving Necessary Skills. 1991. *What Work Requires of Schools*. Washington, DC: US Department of Labor (ED 332 054).

Swartz, R. J. and Parks, S. 1994. *Infusing Critical and Creative Thinking in to Content Instruction*. Pacific Grove, CA: Critical Thinking Press and Software.

Tang, Q.T. 2001. Keynote Address, *UNESCO TVET Asia Pacific Conference*, Adelaide March 26–28.

Task Force on Skill Development. 2007 (May). Report on 11th Planning Commission. Government of India.

World Bank. 2006. Skill Development in India: The Vocational Education and Training System, Human Development Unit, South Asia Region. Available: http://info.worldbank.org/etools/docs/library.

Internet Resources

All India Council for Technical Education:	www.aicte.ernet.in/ApprovInst/ engg_2004.doc
Asian Development Bank:	http://www.adb.org
Department of Higher Education, Ministry of Human Resource, Government of India (Annual Report 2004–2005):	http://education.nic.in/ Annualreport2004-05/Techedu.pdf
Department of Higher Education, Ministry of Human Resource, Government of India (Annual Report 2006–2007):	http://education.nic.in/AR/AR0607-en.pdf
Indian Ministry of Finance, Union Budget and Economic Survey:	http://indiabudget.nic.in
Indian Ministry of Human Resource Development:	http://www.education.nic.in
National Centre for Vocational Education Research, *Defining Generic Skills*:	http://www.ncver.edu.au/research/ proj/nr2102b.pdf
National Profiles in Technical and Vocational Education in Asia and the Pacific (India), UNESCO Documents and Publications:	http://unesdoc.unesco.org/images/ 0010/001049/104924Eb/pdf
	http://unesdoc.unesco.org/images/ 0015/001555/155560e.pdf
	http://www.unesco.org/education/ e-4/initiative
Polytechnics and Colleges, India Education:	http://www.indiaedu.com/ polytechnic-colleges/index.html

Press Information Bureau, Government of India:	http://www.pib.nic.in/archive/others/2007/may07/2007050113.pdf
Standards Council of Canada. The Benefits of Accreditation for Developing Countries:	http://www.scc.ca/Asset/iu_files/benefits_accre_dev_e.pdf
Technical Education and Skills Development Authority:	http://www.tesda.gov.ph

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