Annexure I: Baseline

Libraries

Introduction

Libraries play a pivotal role in the dissemination of knowledge and are extremely important in building a knowledge economy. There is a need to formulate and create mechanisms and institutions which will bring about a paradigm shift in the libraries and information system (LIS) scenario. In today's context, libraries have to play two distinct roles - to serve as a local centre of information and knowledge, and be a local gateway to national and global knowledge. To fulfill this potential, the entire LIS needs to be revamped – existing libraries must modernise their collection, services and facilities, become more pro-active and collaborate with other institutions and agencies.

Current Scenario

Data: There is no authentic information about the number of libraries actually functioning in India. All statistical information seems to be estimated on the basis of pure guesswork. Further, there are institutions operating as libraries without following any benchmark or standard. Therefore, there is a need to prepare a national census of libraries through a nationwide survey. Census data of libraries and their present situation will provide primary data for future planning.

Table 1: Libraries covered by the Raja Ram Mohan Foundation

Level	Number
State Central Libraries	28
Divisional and District Libraries	451
Sub-divisional/Taluka/Tehsil Libraries	501
Town & Rural Libraries	30134
Nehru Yuvak Kendras	272
Jawahar Bal Bhavans	49
Others	128
Total	31563

Source: Raja Ram Mohan Library Foundation

Management and quality: To provide access to knowledge and resources, each library must provide a range of services to meet the needs of a diverse user community. It must also have a well-rounded collection relevant to its user community. In the changed context, it is necessary to assess the manpower requirements for different types of libraries and departments of library and information science and adequately train the library staff.

Education and research: Library and information science education and research has been in existence since pre-independence days. There are approximately 135 universities and institutions of higher learning in this field. But presently most universities and institutions have not kept abreast with the changes in the LIS sector.

Funding: Out of the Tenth Plan outlay of Rs.131.05 crore, an expenditure of Rs.121.23 crore was incurred – indicating a shortfall of 7 per cent. There is a need to set up a central library fund to not only upgrade existing libraries within the specified period of time but to facilitate libraries to overcome the financial stringencies which presently exist. Further, public-private partnerships could be encouraged in developing library and information services in different parts of India.

Table 2: Number of libraries in India (estimated figure 1996-97)

Public libraries	54845
University/Deemed to be University Libraries	267
College Libraries	8000
Science and Technology Libraries	1200
Social Science Libraries	450
Government Department Libraries	800
Art, Culture and Humanities Libraries	500
School Libraries (Higher secondary/ secondary/primary and upper primary)	404128

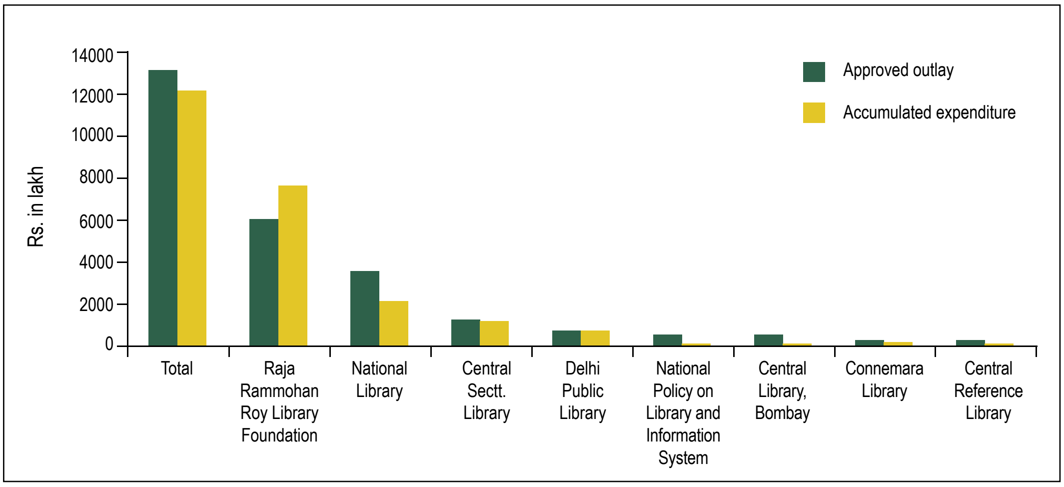
Source: Librarians in Society: An Insider's View, P.R. Goswami

Table 3: **Existing library consortia in India**

Indian National Digital Library in Engineering Science and Technology (INDEST) Consortium	Membership of 164 institutions – 38 core institutions funded by the Ministry of Human Resource Development, Government of India, 44 institutions by the All India Council of Technical Education (AICTE) and 82 self-supporting institutions)
Council for Scientific and Industrial Research (CSIR) e-Journals Consortium	Funded by the CSIR for its all its 44 labs
University Grants Commission (UGC) e-Journals Consortium	Funded by the UGC for 100 universities and being extended to other universities and colleges
DAE e-Journals Consortium	For 36 institutions under Department of Atomic Energy

Source: Higher Education in India, Pawan Aggarwal, ICRIER, 2006

Figure 1: **Libraries: Outlay and expenditure of Tenth Five Year Plan**



Source: Working Group on Art and Culture, Eleventh Five Year Plan, Planning Commission

School Education

Introduction

Reforms in school education are pivotal for creating an edifice on which a knowledge society can be structured. While India has witnessed significant progress in school education, the goal of universal access to elementary education has yet not been achieved. There are also wide disparities in access to school education between states, rural and urban areas, gender as well as different economic classes. In addition, issues of quality such as teacher training, curriculum, pedagogy, school infrastructure and learning outcomes need to be addressed on an immediate basis. There is also an urgent need to increase the resource allocation to school education.

Current Scenario

Literacy: According to the 2001 Census, the literacy rate in India was 64.8 per cent and as per the NSS 61st Round Survey Report, the literacy rate was 67.3 per cent during 2004-05. Further, the gender gap in literacy is estimated to be roughly 20 per cent.

Schools: The number of primary schools in the country increased from 6.64 lakh in 2001-02 to 7.7 lakh in 2005-06. In the same period, the number of upper primary schools increased at a faster rate from 2.20 lakh to 2.9 lakh.

Table 4: Number of schools (in lakh) 2005-06

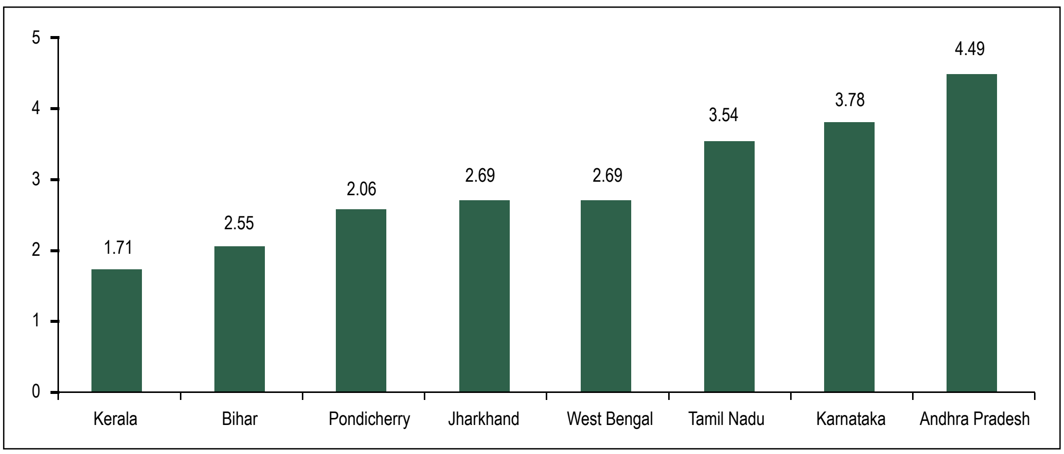
Primary	7.7
Upper primary	2.9
Secondary/Senior Secondary	1.6
Total	12.2

Source: Educational Statistics at a Glance, 2005-06, MHRD

Enrolment: The total enrolment at the primary stage has increased 7 times, from 19.2 million in 1950-51 to 130.8 million in 2004-05. In case of upper primary stage, it increased 17 times, from 3.1 million in 1950-51 to 51.2 million in 2004-05. The enrolment at the secondary/senior secondary increased by 25 times, from 1.5 million in 1950-51 to 37.1 million in 2004-05. However about 180 out of 581 districts in the DISE study (2004-05) reported a decline in primary enrolment.

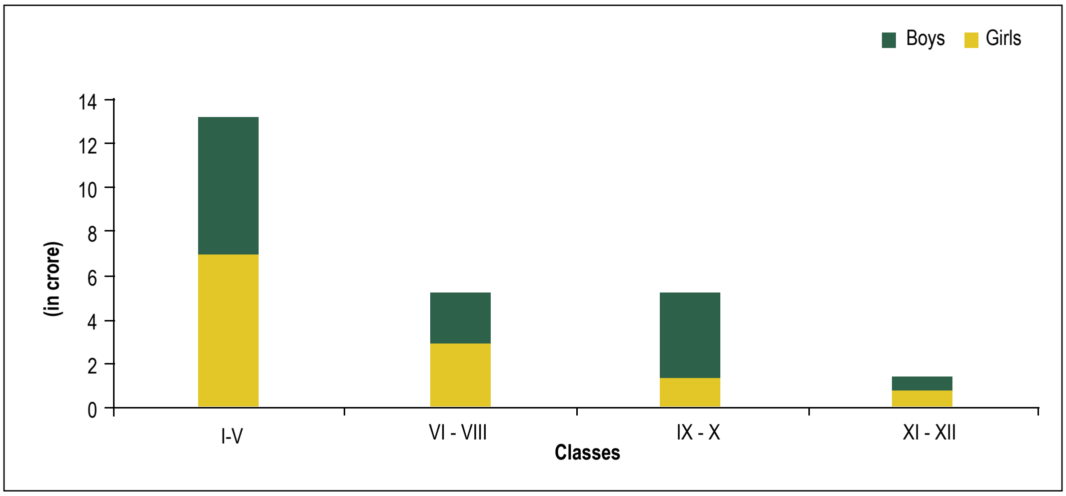
Enrolment rates are particularly low in Bihar, Arunachal Pradesh, Jharkhand, Uttar Pradesh, Rajasthan and Madhya Pradesh, with overall enrolment rates below 80 per cent. There are wide rural-urban disparities,

Figure 2: Number of schools per 1000 students in the relevant age group



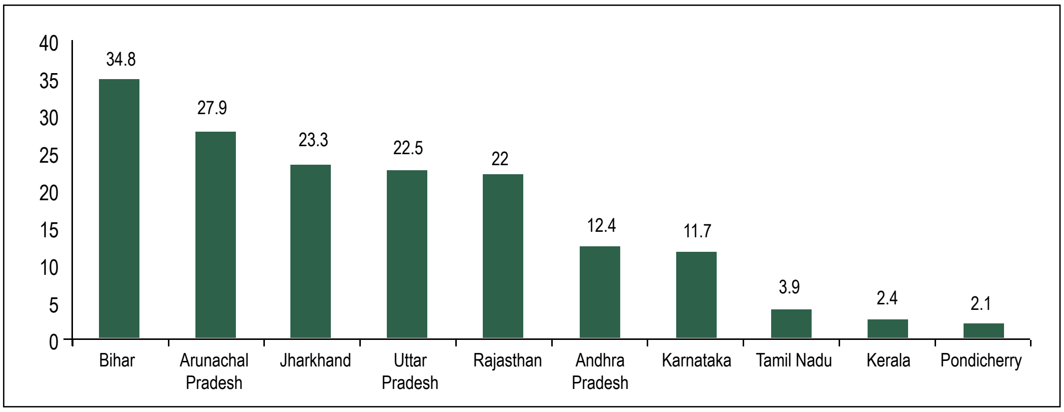
Source: Elementary Education in India, Analytical Report NUEPA, 2005-06

Figure 3: Stage wise enrolment (2005-06)



Source: National Level Statistics 2005-06, MHRD

Figure 4: Percentage of students in the relevant age-group not enrolled in school



Source: Elementary Education in India, Analytical Report, NUEPA, 2005-06

except in the Union Territories, North-eastern states, Kerala and to some extent Tamil Nadu. Gender disparities tend to be sharpest in states with low aggregate attendance rates.

The total Scheduled Castes enrolment at the primary (I-V), upper primary (VI-VIII) and secondary/senior secondary (IX-XII) stages of school education from 1980-81 to 2004-2005 increased by 2.25, 3.91 and 4.52 times respectively. The total Scheduled Tribes enrolment at the primary, upper primary and secondary/senior secondary stages of school education from 1980-81 to 2004-2005, increased by 2.94, 5.62 and 6.33 times respectively. Further, the average of 604 districts in 2005-06 indicates a gender parity index (GPI) of 0.92 in primary classes and 0.84 in case of enrolment in upper primary classes compared to 0.91 and 0.83 in 2004-05. In 2003-04, GPI in primary and upper primary enrolment was 0.90 and 0.82 respectively. The social composition of out of elementary school children indicates that 9.97 per cent of Muslim children, 9.54 per cent of STs, 8.17 per cent of SCs and 6.97 per cent of OBC children were out of school and an overwhelming majority (68.7 per cent) was concentrated in five States viz. Bihar (23.6 per cent), Uttar Pradesh (22.2 per cent), West Bengal (9 per cent), Madhya Pradesh (8 per cent) and Rajasthan (5.9 per cent).

Drop Outs: The drop-out rates represent percentage of pupils who drop out from a given grade or level of education in a given school year. The rate of drop outs has decreased from 64.9 per cent in 1960-61 to 29.00 per cent in 2004-2005 in primary classes. The rate of dropout which was 78.3 per cent in 1960-61, has come down to 50.84 per cent in 2004-2005 in the upper primary classes. Similarly, the dropout rate which was 82.5 per cent in 1980-81, has decreased to 61.92 per cent in 2004-2005 in the secondary classes, implying an improvement in retention rates. The drop-out rates at primary levels for SCs (34.2 per cent) and STs (42.3 per cent) are substantially higher than the national average (29 per cent).

Table 5: Number of teachers by type of schools and pupil:teacher ratio

Type of School	No. of teachers (in lakh)	Percentage of trained teachers	Female teachers per 100 male teachers	Pupil teacher ratio
Primary	21.8	86	65	46
Upper primary	16.7	87	67	34
High schools	11.2	89	61	32
Higher/ Senior secondary	10.3	90	62	34

Source: National Level Statistics 2005-06, MHRD

Teachers: The total number of teachers in primary schools increased from 5.38 lakh in 1950-51 to 21.6 lakh in 2004-2005 i.e. by more than four times. However, the number of teachers is still not adequate to meet the needs of the bourgeoning student population as is evident from the teacher pupil ratio.

During the year 1950-51 the pupil teacher ratio in primary schools was 1:24, in middle schools it was 1:20 and in higher/higher secondary schools, the pupil teacher ratio was 1:21. By 2004-2005 this ratio had increased to 1:46 in primary schools; 1:35 in upper primary schools and 1:33 in secondary/senior secondary schools. Though the number of educational institutions has considerably increased after Independence and also the number of teachers, the higher pupil teacher ratio indicates that the increase in enrolment at each level is comparatively more than the increase in number of teachers. The increased enrolment at various levels also underscores the need for opening of a greater number of educational institutions as well as employing more teachers for improving the quality of education.

Teacher training programs: Teacher training has been identified as a crucial input for quality school education. However, the status of teacher training in India is a matter of great concern. According to DISE data, only 33 per cent of the teachers received in-service training in 2005-06. In 2002, 65467 men and 67096 women enrolled into teacher training courses in India. There are at present, about 571 DIETs, and DRCs, 104 Colleges of Advanced Teaching and 31 Institutes of Advanced Studies in Education, for pre-service and in-service training, functioning in the country.

Teacher Absenteeism: Teacher absenteeism has been identified as a major impediment to improvement in quality of school education. The PROBE survey in 242 villages across 5 north Indian states found that in about half the schools, there was no teaching activity at the time of the investigators' visit. It is significant that this pattern occurred even in cases where the school infrastructure (in terms of number of class rooms, teaching aids and even teacher-pupil ratio) was relatively good.

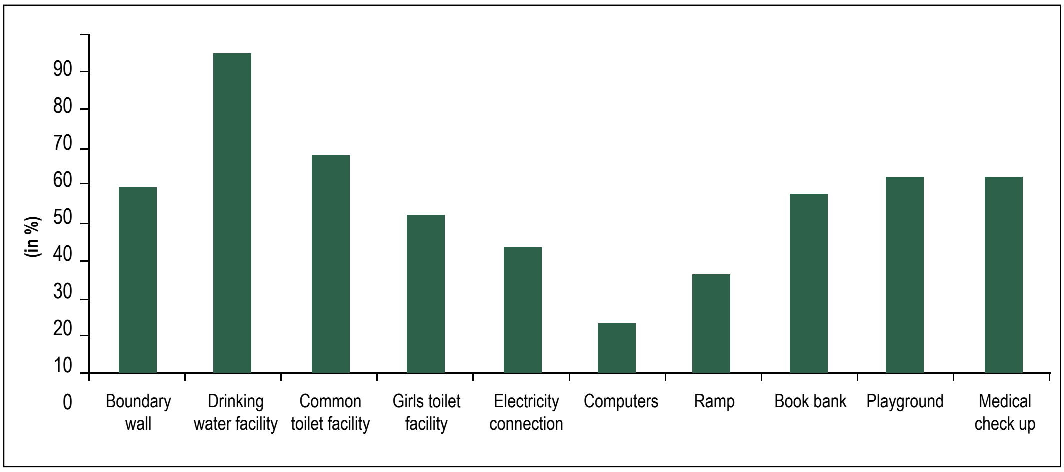
Infrastructure: There is a severe lack of basic infrastructure in schools in India. The PROBE (1999) survey, for instance, found the following with respect to government schools: (a) only a fourth of the sample schools had at least two teachers, two all-weather classrooms, and some teaching aids; (b) at the time of the investigator's visit, one-third of the headmasters were absent, one-third of the schools had a single teacher present, and about half of the schools had no teaching activity; (c) in many schools class students were systematically neglected. Similarly, the DISE survey found that only about 50 per cent of the schools had boundary walls, 33 per cent had electricity connections, and 52 per cent had playgrounds. These represent serious flaws in the schooling process.

Management: At present, government and local bodies own more than 90 per cent of the primary schools, 72 per cent of the upper primary schools and 39 per cent of the secondary schools. There are indications of a rise in the number of private unrecognised schools in India. According to the DISE Analytical Report as many as 63,411 and 1,26,110 schools in 2005-06 were being managed by the private aided and private unaided managements respectively. Together, they run a total of 1,89,521 schools (16.86 per cent). There is evidence to suggest that private schools are concentrated in areas where government funded schools are dysfunctional. Although the student profile of private schools is more economically advantaged, the rate of enrolment from poor families has also increased steadily. Findings from the MIMAP survey in India show that, of all school-enrolled children aged 5-10 years old living below the poverty line, 14.8 per cent attended private schools (8 per cent in rural and 36 per cent in urban India). The corresponding figures for ages 11-14 years and 15-17 years were 13.8 per cent and 7 per cent respectively (Pradhan and Subramaniam, 2000). Further, amongst the students from poor backgrounds in private schools, the majority are male.

Curriculum, pedagogy and learning outcomes: An all India study *Annual Status of Education Report* (ASER) conducted by PRATHAM in 2006 found the levels in arithmetic and reading amongst primary school children to be surprisingly low. Close to 35 per cent of children in the 7-14 age group could not read a simple paragraph (grade 1 level difficulty) and almost 60 per cent of children could not read a simple story (grade 2 level). In Government Schools, 49.6 per cent of classes II-IV could not subtract (level 1), and 77.8 per cent could not complete sums in division. In private schools, 37.9 could not subtract (level 1) and 66.7 per cent could not finish division sums (level 2). The situation in Tamil Nadu, Karnataka and Gujarat (where the schools function and where all provision related indicators are good) are far worse than in Bihar and Chhattisgarh (where indicators like teacher-pupil ratio, drop out rates are extremely high, and there are fewer schooling facilities). The high failure rates, especially among the rural, economically weaker and socially deprived children, forces one to critically review the whole system of evaluation and examination.

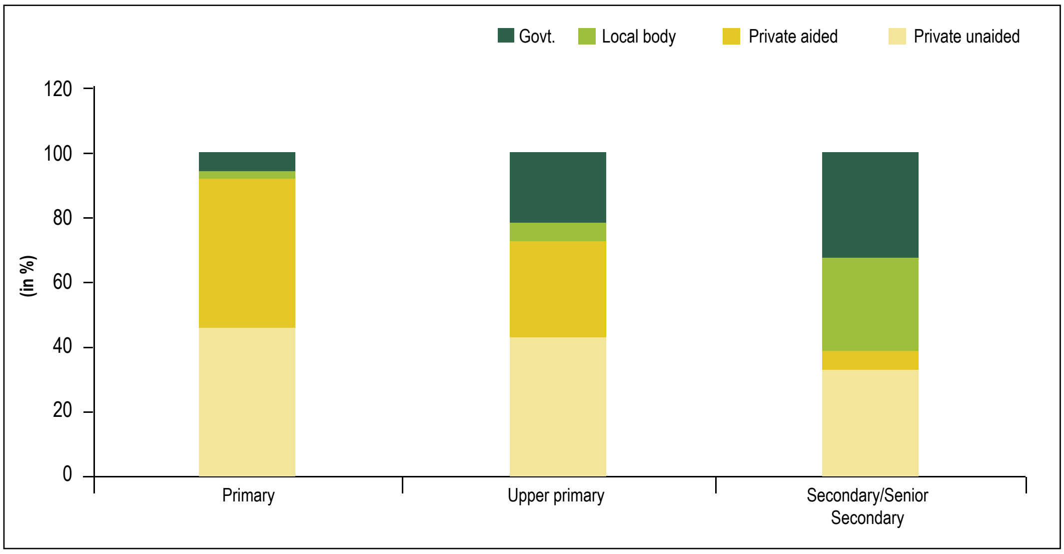
It is widely recognised that there is a need to shift focus from rote learning from textbooks to developing basic skills and the ability of students to apply their learning to real situations. Also creativity, problem-solving ability and encouragement for construction of knowledge based on students' own experiences needs to be promoted. Introducing accountability and developing other measures to improve teaching

Figure 5: Percentage of schools with basic facilities



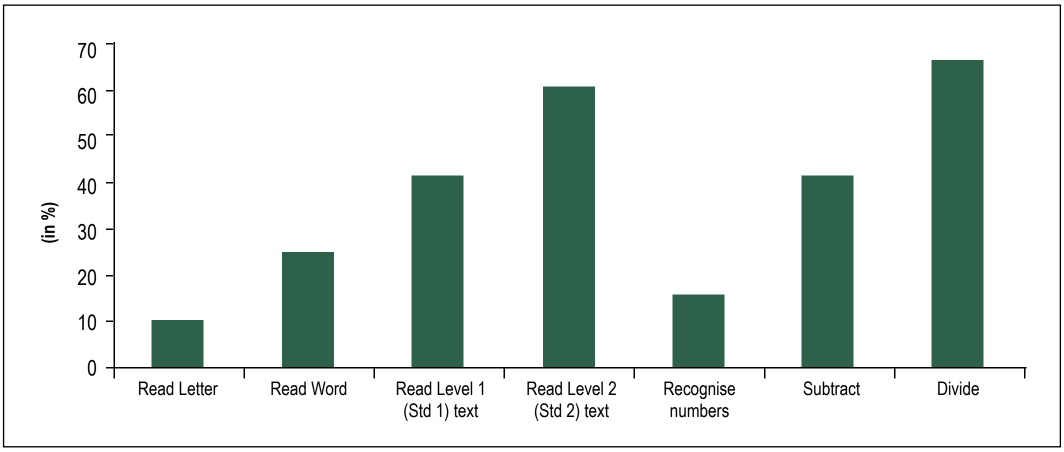
Source: Elementary Education in India, Analytical Report 2006-07

Figure 6: Management-wise percentage of schools



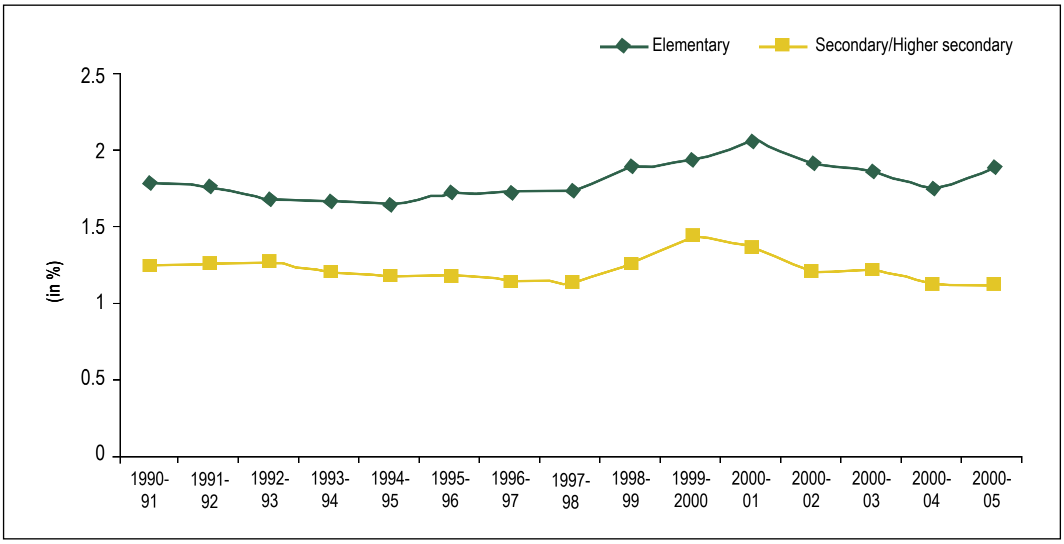
Source: National Level Statistics 2005-06, MHRD

Figure 7: Percentage of children (Class I to VIII) who cannot



Source: Annual Status of Education Report (Rural) 2006

Figure 8: Expenditure on education as a percentage of GDP



Source: MHRD

quality at the primary level needs to be thought of. The National Policy on Education (NPE), 1986 postulated that the examination system should be recast so as to ensure a method of assessment that is a valid and reliable measure of student development and a powerful instrument for improving teaching and learning be developed.

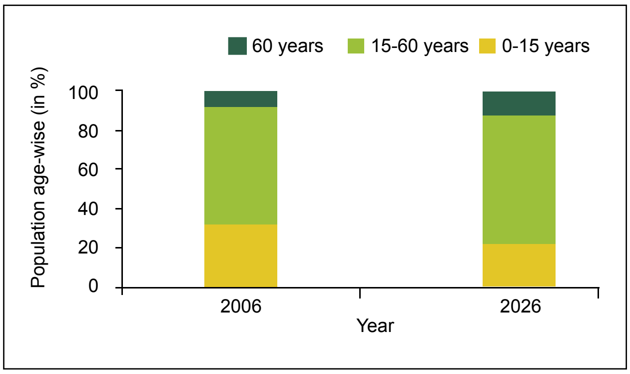
Government funding: The share of public expenditure on education has been declining steadily and was 3.5 per cent in 2004-05. The share of elementary education was Rs. 40,000 crores out of almost 100,000 crores allotted to education. This amount is insufficient to provide universal elementary education of eight years for every child in the age group 6 – 14 years. It is also less than the proportion of GDP invested in education in many other developing countries. India's total expenditure on school education for the year 2005-06, elementary and secondary combined was around Rs. 78,661 crores, amounting to only 2.46 per cent of GDP. The Tenth Plan outlay for Elementary Education and Literacy was Rs. 30,000 crore. The actual expenditure has been Rs. 48,201 crore, out of which SSA (Rs. 28,077 crore) and MDM (Rs. 13,827 crore) account for 88 per cent. The graph below shows public expenditure on education from year 1992-93 to 2005-06 in 1993-94 constant prices. The percentage allocation for education was around 3.5 per cent of GDP until the late 1990s, rose to more than 4 per cent at the turn of the decade but has since declined to 3.75 per cent of GDP.

Vocational Education and Training

Introduction

The transition of India into a knowledge-based economy requires a skilled workforce, and therefore a renewed focus on the vocational education and training (VET) system. Moreover, the current and expected demographic composition of the country's population (See Figure) makes it imperative that the issue of employability and skills be addressed immediately. A third of India's population was below 15 years of age in 2000 and close to 20 per cent were young people in the 15-24 years age group. If this demographic dividend is not optimally utilised through skill development, we run the risk of growing unemployment among high skilled "formally trained" personnel and shortages of low level skilled and vocationally trained people in the labour market.

Figure 9: Demographic Composition of India's population



Source: Based on the Report of the Technical group on population projections constituted by the National Commission on Population, May 2006

Current Scenario

In India, skill acquisition takes place through two basic structural streams – a small formal one and a large informal one. Some of the major formal sources are listed in Table 6:

Status of vocational training received/being received: In the NSS 61st round, among persons of age 15-29 years, only about 2 per cent reported to have received formal vocational training and another 8 per cent reported to have received non formal vocational training.

Age specific rate for formal vocational training received: The proportion of persons who received formal vocational training generally increases with age of persons. In fact, the proportion increased from 0.6 per cent for the age group 15-19 years to 1.8 per cent for the age group 20-24 years and then, to 1.9 per cent for the age group 25- 29 years in the rural areas.

Table 6: Vocational education and training in India

Type of Source	Institute	Capacity	Quantity
Mainstream education system	Centrally Sponsored Scheme of Vocationalisation of Secondary Education run by the Ministry of Human Resource Development	Enrolling less than three per cent of students at the upper secondary level	9,583 schools offering about 150 educational courses of two years duration
Training institutions outside the school and university systems	Industrial Training Institutes (ITIs) and Industrial Training Centres (ITCs)	Total seating capacity of 7.85 lakh	5488 public (ITI) and private (ITC) institutions imparting VET, of which 1922 are ITIs and 3566 are ITCs.
Diploma level	Polytechnics	1,244 polytechnics run by MHRD with a capacity of over 2.95 lakhs	1,747 AICTE approved diploma programs with 294,370 seats

Formal vocational training and broad activity status: The proportion of persons (15-29 years) who received formal vocational training was the highest among the unemployed. The proportion was around 3 per cent for the employed, 11 per cent for the unemployed and 2 per cent for persons not in the labour force

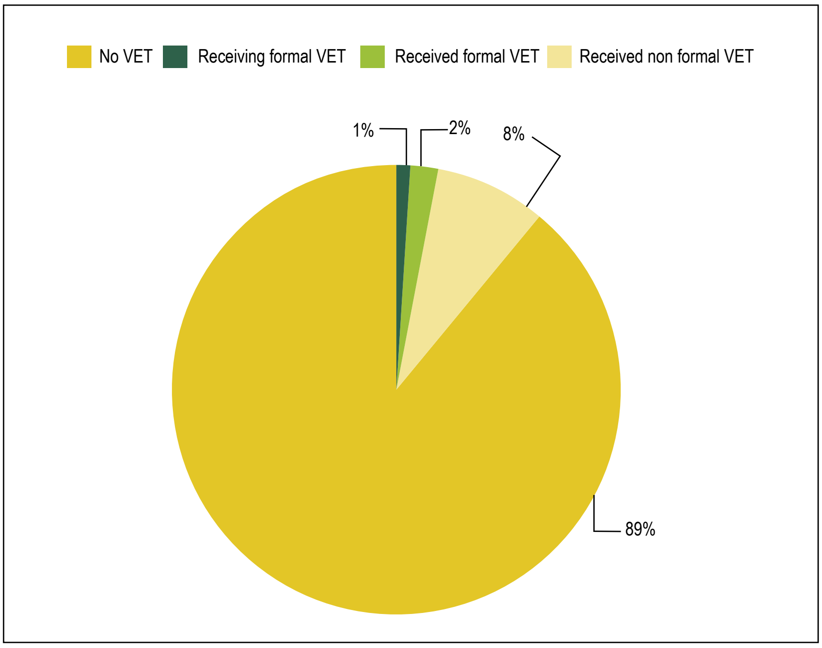
Issues in the Current Framework

1. Participation: The Kothari Commission on Educational Reforms, 1966 had visualised that 25 per cent of the students at the secondary stage would go for the vocational stream. At present only about 5 per cent of the children of the 16 to 18 age group are in the vocational stream. This is despite the fact that in urban areas, only about 19.6 per cent of male and 11.2 per cent of female workers possessed marketable skills, whereas, in rural areas only about 10 per cent of male and 6.3 per cent of female workers possessed marketable skills. This figure is far higher in developed even developing countries

2. Capacity utilisation: There is little capacity in vocational education and even that is under-utilised. Only 6,800 schools have received grants and the total enrolment reported is only about 5 per cent at most. More recent information suggests that the enrolment figure is less than three per cent of the students attending Grades 11-12. The weighted average capacity utilisation of the schools receiving grants is about 42 per cent. This implies that between 350,000 to 400,000 students are enrolled in vocational education, which works out to less than three per cent of the 14 million students or more in Grades 11 and 12, implying that less than one per cent of students who had entered Grade 1 over the last decade or so would have eventually participated in vocational education. It is also widely recognised that existing student capacity in ITIs/ITCs largely goes unutilised.

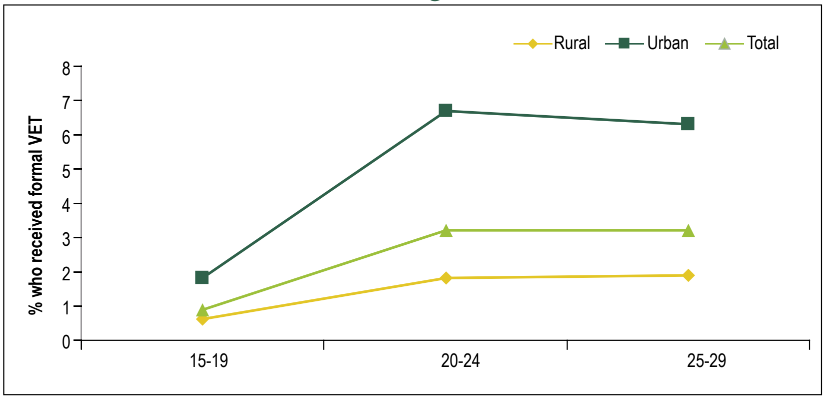
3. Flexibility: The current framework requires minimum qualifications, varying

Figure 10: Status of Vocational Education and Training (VET)



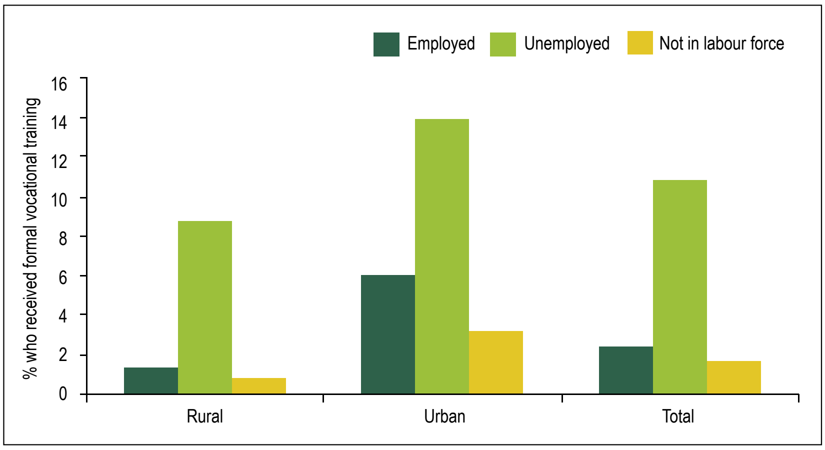
Source: Status of Education and Vocational Training in India, 2004-05, NSS 61st Round

Figure 11: Urban-rural break up of Vocational Education and Training



Source: Status of Education and Vocational Training in India, 2004-05, NSS 61st Round

Figure 12: Activity status of persons receiving vocational training



Source: Status of Education and Vocational Training in India, 2004-05, NSS 61st Round

Table 7: International comparisons on size of vocational-secondary education

Country	Secondary enrolment ratio	Number of students (thousands)	Vocational-technical share (per cent of total secondary enrolments)
Russia	88	6277	60
China	52	15300	55
Chile	70	652	40
Indonesia	43	4109	33
Korea	93	2060	31
Mexico	58	-	12
Malaysia	59	533	11
South Africa	77	-	1

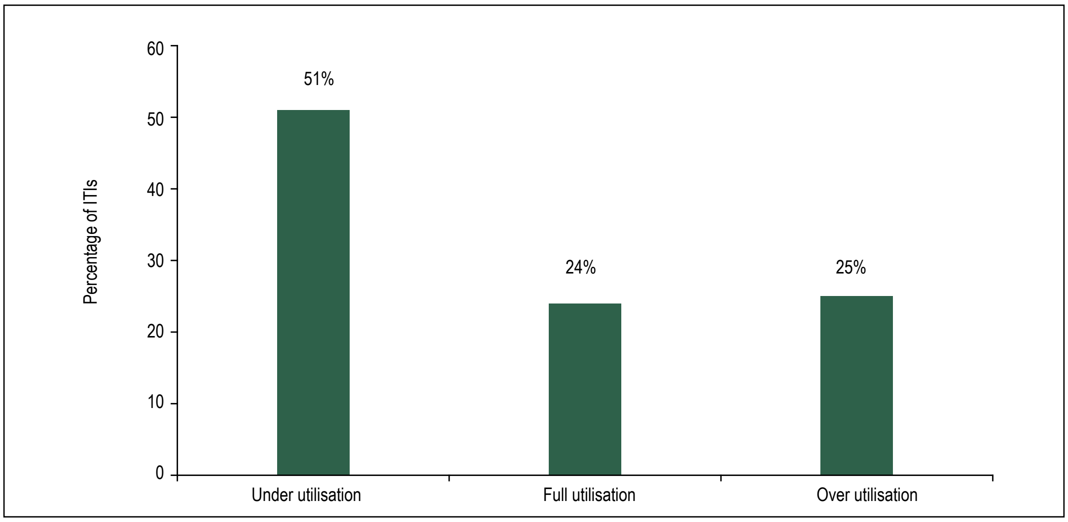
Source: World Bank, 2006

Table 8: All India seats utilisation in respect of technician, trade and graduate apprentices

	Seats located	Seats utilised	Per cent utilisation
Technician apprentices	39004	22837	59 per cent
Trade apprentices	182046	127741	70 per cent
Graduate apprentices	20420	6084	22 per cent

Source: Annual Report 2002-03, Ministry of Labour, Govt. of India

Figure 13: Seat utilisation against sanctioned strength



Source: FICCI Survey, 2006

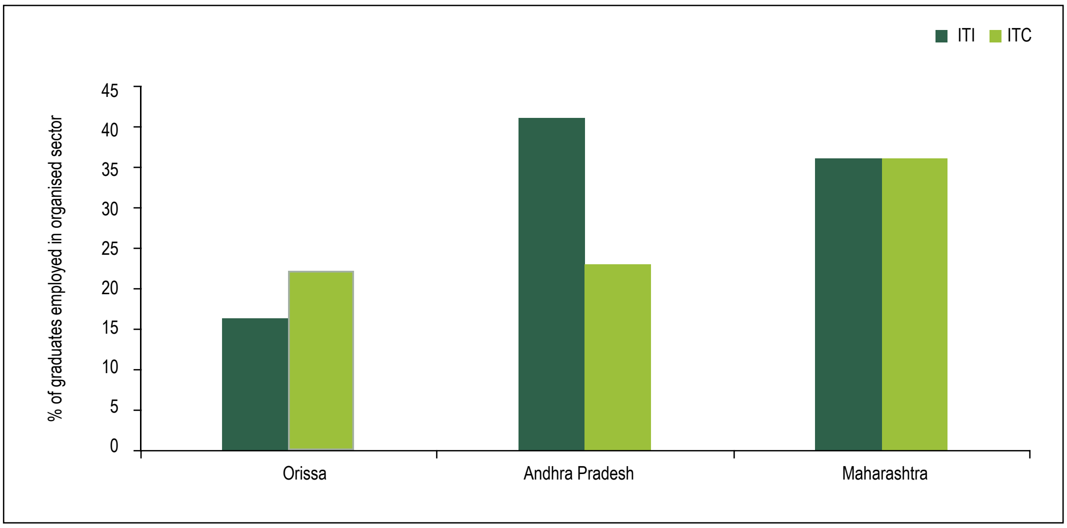
from Class VIII – Class XII, for participation in formal vocational training. While this may be necessary for certain trades, it is unnecessarily restrictive in others. Also, once an individual leaves mainstream education for vocational training, there is no provision for him/her to return to the former at a later stage. Not only does this encourage a general view of work and study being mutually exclusive options, it also increases the perceived risk of taking up vocational training. The system is also not responsive to labour market demand conditions. The inflexibilities in the course/curriculum set-up, lead to over supply in some trades and shortages in others. Moreover, there is not enough emphasis on short training course designed to impart specific skills. Vocational education and training in India relies exclusively on a few training courses with long duration (2 to 3 years) covering around 100 skills. In China, on the other hand, there exist about 4000 short duration modular courses which provide skills more closely tailored to employment requirements.

4. Impact: Of the trained candidates, the labour market outcomes as seen from placement/ absorption rates are reportedly very low. Although countrywide figures on the labour market success of ITI/ITC graduates are difficult to come by, an ILO study reports that in the states of Orissa, Andhra Pradesh and Maharashtra, the percentages of graduates found to be in wage employment/self-employment upon graduation from ITIs were 16.2 per cent, 41 per cent and 35 per cent respectively. The corresponding percentages for those graduating from ITCs were 21.3 per cent, 22.8 per cent and 35.6 per cent respectively

5. Industry linkages: Although provisions exist for the participation of industry representatives/experts in the setting of curriculum and hiring of apprentices, there is a significant mismatch between industry skill requirements and the talent pool emerging from ITIs/ITCs. This is one of the factors contributing to low success in the labour market for VET graduates. The private sector does undertake in-house training programs and to a very limited extent also trains 'outsiders'. However, such programs are limited to catering to their own felt needs, in the nature of captive skill development. Low paying capacity of learners and the reluctance of industries to train workers for fear of losing them to competition has resulted in chronic deficiency in private investment in this area.

6. Quality and accreditation: The quality of the training imparted is also a matter of concern, as the toolkits, faculty, and curriculum are reportedly sub-standard. The existing institutions also lack financial and administrative autonomy. The testing, certification & accreditation system is reportedly weak, and since the deliverables are not precisely defined, there is no effort at evaluating outcomes and tracking placements. The problem is further complicated with lack of industry-faculty interaction on course curricula and other factors. The system of vocational training is currently characterised by a lack of ongoing monitoring for quality in institutions imparting VET. Although a system of inspections by State governments is in place, this is sub-optimal because it permits the proliferation of rent-seeking practices and does not achieve its stated objectives. An autonomous system of accreditation is missing in the VET sector.

Figure 14: Employment status of ITI/ITC graduates



Source: Industrial Training Institutes of India: The Efficiency Study Report, ILO, 2003

Table 9: Internal efficiency of ITIs and ITCs in 3 states

Indicator	Orissa		Andhra Pradesh		Maharashtra	
	ITIs	ITCs	ITIs	ITCs	ITIs	ITCs
Student retention	80.9	94.9	68.3	84.8	85.6	89
Graduation rate	88.3	95.6	62.9	62.7	77.5	79.4
Capacity utilisation	102.1	101	77.4	83.3	92.2	91
Student:Teacher ratio	9.3	5.4	5.5	9.6	-	-
Overall internal efficiency	73.8	90.9	31.8	45.7	62.6	61.1

Source: Industrial Training Institutes of India: The Efficiency Study Report, ILO, 2003

Higher Education

Introduction

A demographic explosion in the young population of the country means that higher education needs to keep apace with the growth in the relevant population. As per the 2001 Census, 31.2 per cent of the country or 337 million were below the age of 15. Providing higher education for this group is imperative and has to be provided on an unprecedented scale to meet the challenges of this unique demographic trend. The higher education sector currently faces major challenges of quality and excellence, and of improving access with inclusiveness. The proportion of our population, in the relevant age group, that enters the world of higher education is only about 10 per cent (2004-05). Access to higher education in terms of the available number of seats in universities is simply not adequate in relation to the current demand. There are also large disparities in enrolment rates across states, urban and rural areas, sex, caste and poor-non-poor.

Current Scenario

Institutions: As in 2006, the Indian higher education system consisted of 355 universities and 18,064 colleges - there exist 20 Central Universities, 216 State Universities, 101 Deemed Universities, 5 Institutions established through State Legislation and 13 Institutions of National Importance.

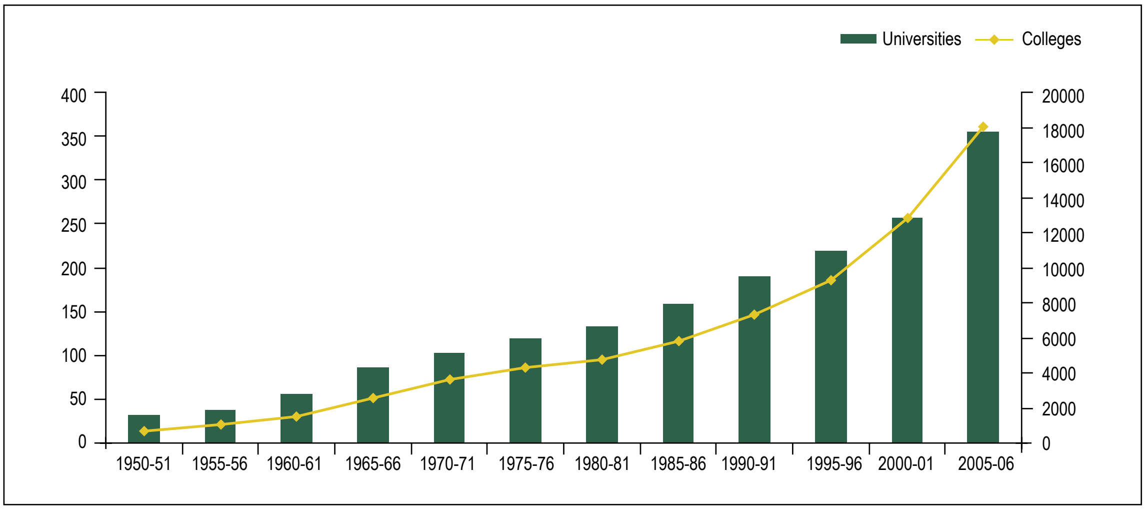
Enrolment: Around 110 lakh students were estimated to be currently enrolled in the Indian higher education system in 2005-06. The growth of student enrolment in higher education in India has been uneven and slow. For instance, while the enrolment grew by 6.7 per cent in 2001-2002, in 2005-06 it grew by 5.2 per cent.

Teachers: The total number of teachers in the higher education system is 4.88 lakhs. Out of the total teaching faculty, 84 per cent were employed in affiliated colleges and only 16 per cent in the universities and university colleges. The student-teacher ratio works out to 18 in the university departments and colleges and 23 in the affiliated colleges.

Issues in the Current Framework

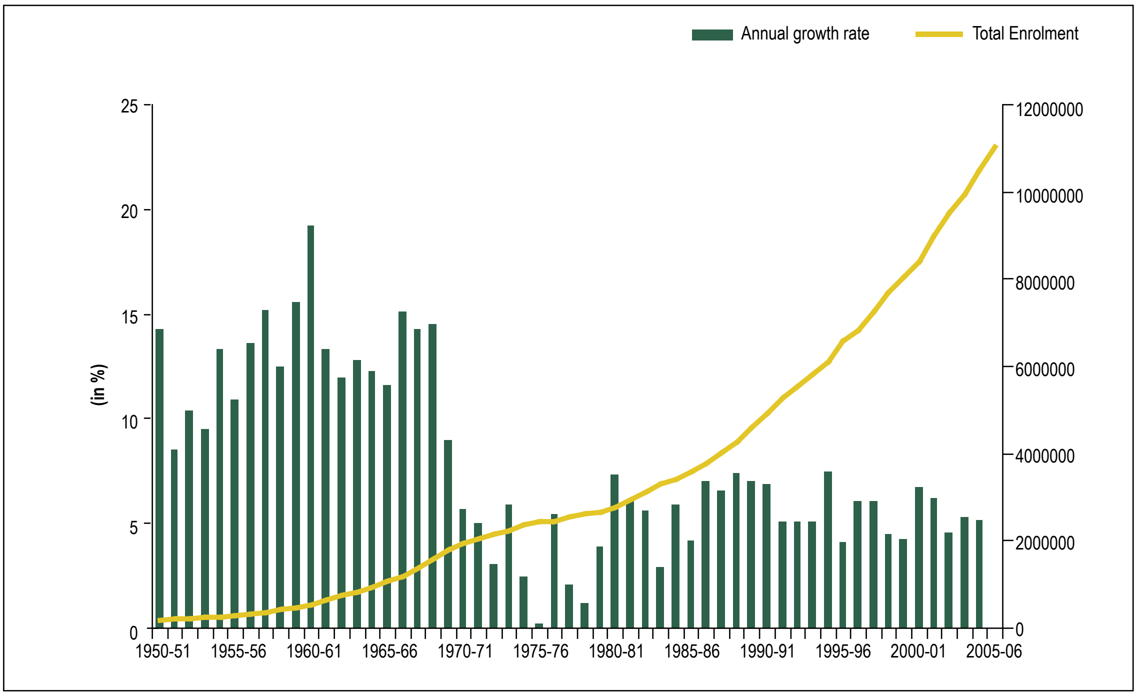
Expansion: The current enrolment in higher education stands at about 11 million. While there has been a consistent growth in enrolment in higher education over the last few years, this is not enough when compared

Figure 15: Growth of higher education system



Source: UGC

Figure 16: Growth of student enrolment in higher education in India (1950-51 to 2005-06)



Source: UGC

Table 10: Number of teachers in institutions of higher education, 2005-06

Institution	Enrolment (in thousands)	Teachers (in thousands)	Student:Teacher ratio
University Departments & University Colleges	1427	79	18
Affiliated Colleges	9601	409	23
Total	11028	488	22

Source: UGC Annual Report, 2005-06

to other countries. The gross enrolment ratio (GER) for higher education currently is around 10 per cent whereas it is 25 per cent for many other developing countries. Even South-east Asian countries show much higher enrolment: Philippines (31 per cent), Thailand (19 per cent), Malaysia (27 per cent) and China (13 per cent). The enrolment figure for the USA is 81 per cent, 54 per cent in the UK and 49 per cent in Japan. Various committees that have examined the higher education scenario in India have recommended an increase in the GER to at least 20 per cent. For instance, the CABE Committee on Financing of Higher Education concluded on the basis of international experience that an enrolment rate of 20 per cent or more is consistent with a turnaround in economic performance. If India has to achieve the target soon, it would imply more than doubling the scale and size of the higher education system within the next 5 to 7 years.

Table 11: Gross Enrolment Ratio (GER) for 18-24 years (in percentage)

Year	Higher Education
2001-02	8.07
2002-03	8.97
2003-04	9.21
2004-05	9.97

Source: MHRD

Access: With high disparities, inclusive education has remained an elusive target. Inter-caste, male-female and regional disparities in enrolment still remain prominent. For example, while the gross enrolment ratio for people living in urban areas was almost 20 per cent, it was only 6 per cent for rural areas. Further, the gross enrolment ration for Scheduled Tribes (STs), Scheduled Castes

(SCs) and Other Backward Classes (OBCs) was 6.57, 6.52 and 8.77 respectively, much lower than the all-India figure of 11.

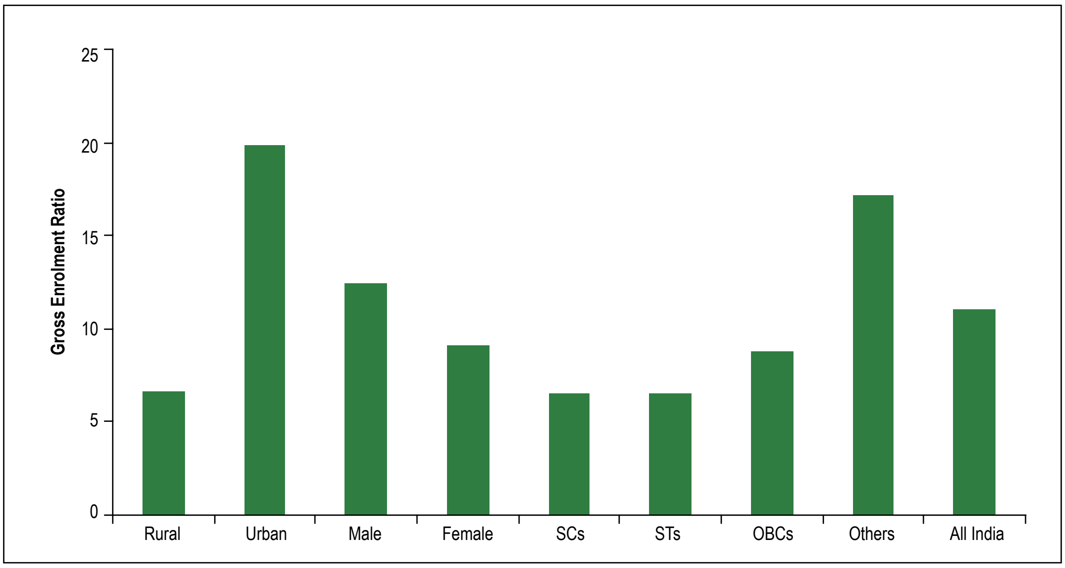
Regulation: The regulatory structures in the current higher education system are cumbersome. Entry through legislation alone, at present, is a formidable barrier. It requires an Act of Legislature of Parliament to set up a university. The deemed university route is much too difficult for new institutions. The consequence is a steady increase in the average size of existing universities with a steady deterioration in their quality. The absence of competition only compounds problems. A vast majority of the colleges are not recognised by UGC under section 2(f) of UGC Act. This poses a great challenge for the UGC in respect of maintenance of standard of teaching and examination in higher education. Also the current system of affiliated colleges for undergraduate colleges is not adequate. These are affiliated to large unwieldy universities, making it difficult to monitor the standard of education being imparted. Currently about 90 per cent of the undergraduate enrolment and 67 per cent of the postgraduate enrolment is in the affiliated colleges. There are a large number of institutions that are technically under the purview of the UGC but are not provided financial support by it because they fail to fulfill the minimum eligibility norms.

Faculty: Shortage of quality faculty is one of the main problems afflicting higher education in India today. Teacher shortages often occur due to non availability of suitably qualified people. Further, the academic profession has seen a steady decline in popularity – possibly as a result of lack of incentives here and more lucrative opportunities in other professions. Apart from increasing compensation of teachers, there is also a need to introduce performance-based incentives in order to ensure teaching of superior quality.

Funding: Public expenditure (Centre and States) on education is only around 3.6 per cent of GDP. Government funding of higher education is still below 1 per cent of GDP. The percentage expenditure on University and Higher Education to GDP, which was 0.77 per cent in 1990-91 showed a gradual decrease to 0.66 per cent in 2004-2005. Various committees have unanimously recommended that state funding be increased to 6 per cent. While the Central Advisory Board for Education (CABE) recommends spending 1 per cent to higher education and 0.5 per cent to technical education, the proportions in 2004-05 were 0.34 per cent for higher education and 0.03 per cent for technical education.

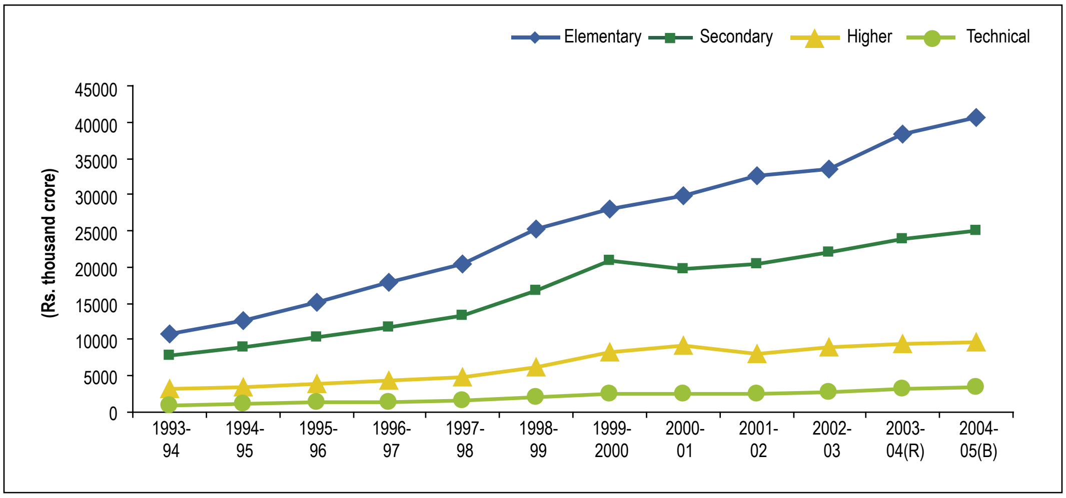
India also has one of the lowest public expenditure on higher education per student at 406 US Dollars, which compares unfavourably with Malaysia (11,790 dollars), China (2728 dollars), Brazil (3986 dollars), Indonesia (666 dollars) and the Philippines (625 dollars). In nominal terms the public expenditure per student in higher education stood at Rs. 12518 respectively in 2003-04. The trend analysis shows that the increase is not that marked if we consider the growth in enrolment, with the nominal public expenditure per student in higher education going up by only 40 per cent from 1993-94 to 2003-04. In fact, in real terms, public expenditure per student in higher education has declined from Rs. 8961 in 1993-94 to Rs. 7117 in 2003-04.

Figure 17: Disparities in enrolment in higher education (2004-05)



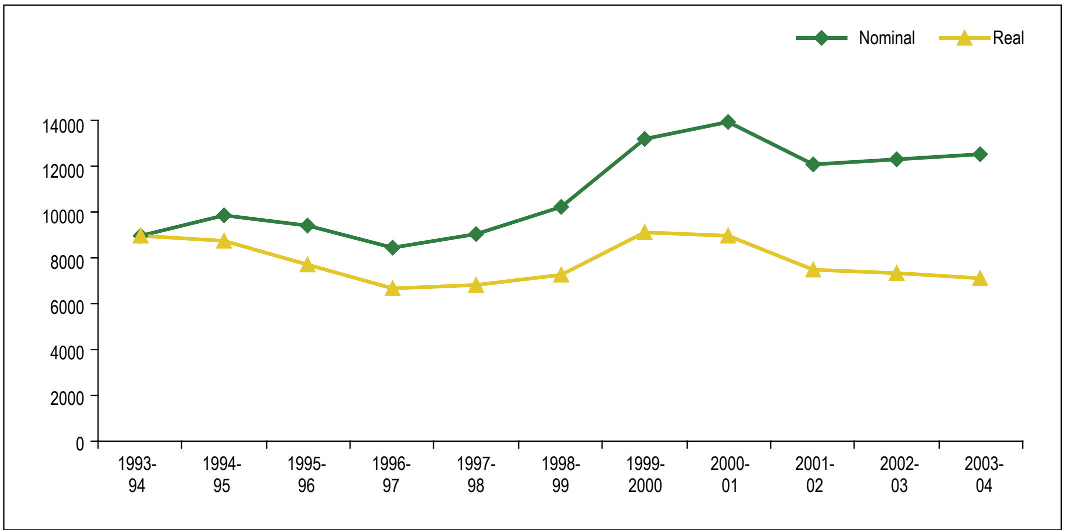
Source: UGC

Figure 18: Sector-wise plan & non-plan budgeted expenditure for education departments of State & Centre (Revenue Account)



Source: MHRD

Figure 19: Public expenditure per student in higher education - nominal and real



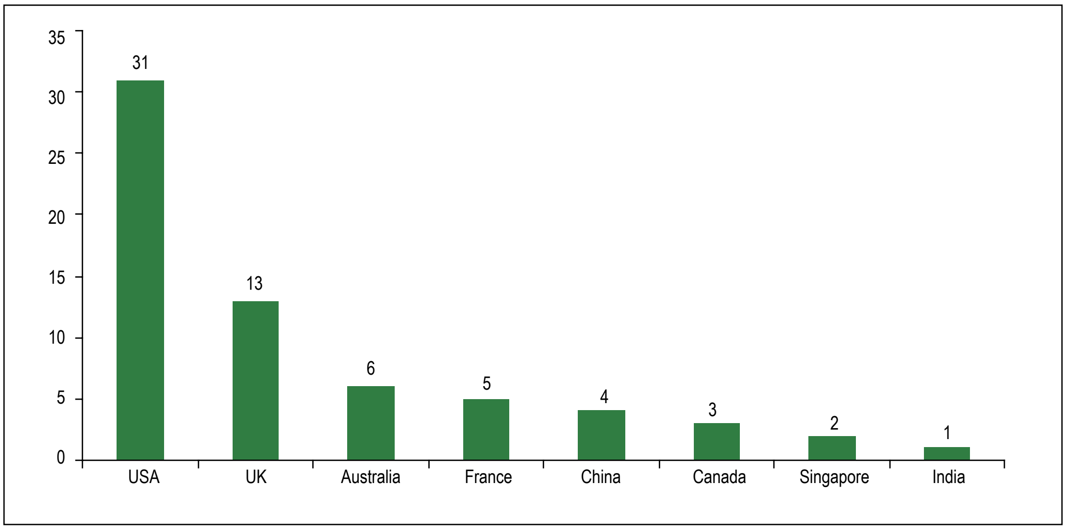
Source: Analysis of Budgeted Expenditure on Education, MHRD, Govt. of India

Private institutions: The share of private unaided higher education institutions increased from 42.6 per cent in 2001 to 63.21 per cent in 2006. Their share of enrolments also increased from 32.89 per cent to 51.53 per cent in the same period. This trend is likely to continue and therefore, it is reasonable to expect that about half of incremental enrolment targeted for higher education will come from private providers. There is a need for the state to recognise the role of the private sector and encourage their participation. There has already been a de-facto privatisation of the professional education sector, with more than 80 per cent of the engineering colleges being privately funded and managed. While there are strict entry barriers for the private sector, there is not enough regulation on the products and outputs of the private sector.

Accreditation: Accreditation in higher education pertains to determining the quality of an institution. The criteria on which institutions are judged typically involve expected student achievement, quality of curriculum, faculty, academic support and services for students, and financial capacity. In India accreditation (unlike in other countries such as the USA and the UK) is performed by government agencies. The National Assessment and Accreditation Council (NAAC) was set up by the UGC in 1994 to accredit institutions of higher education. The NAAC's assessment is based on pre-determined criteria that combine self-study and peer review. NAAC accredits and certifies for educational quality in institutions based on seven criteria with different weights for each criterion, and for different types of institutions. NAAC has so far completed accreditation of only 140 out of the 355 universities and 3,492 out of the 18,064 colleges. This covered just over 10 per cent of all institutions, and barely any private colleges and universities. The results of the accreditation process thus far indicate serious quality problems. Only 9 per cent of the colleges and 31 per cent of the universities are rated as 'A' grade and the rest fall in 'B' and 'C' categories. Accreditation by NAAC is voluntary and valid for five years. However, very few institutions have applied for accreditation by NAAC.

Quality: There are concerns about the quality of higher education provided in India currently. There is an annual outflow of more than 1,50,000 students to institutes in the west every year – driving out nearly 2-3 billion dollars in foreign exchange per annum. It makes India the second-largest target market globally for education institutes in the west. Though the problem of reaching world class standards is not as pressing as meeting the larger needs of the population, India's standing in this regard is indicative perhaps of the generally low standards. In a London Times Higher Education Supplement ranking of the top 200 universities, only 1 Indian institution was listed, while the Shanghai University ranking of 500 world-class universities featured only 3 Indian universities.

Figure 20: Country wise Number of Universities in Times Top 100 Universities



Source: Times Higher Education Supplement, London

Table 12: Current Quality Status in Colleges of Higher Education in India (2005)

Details	Number
Total number of colleges	17,625
Number of colleges under UGC purview	14,000
Number of colleges recognised under Section 2(f) of UGC Act	5,589 (40 per cent)
Number of colleges recognised under Section 12(B) of UGC Act	5,273 (38 per cent)
Number of colleges actually funded by the UGC	4,870 (35 per cent)
Number of colleges accredited by the NAAC	2,780 (20 per cent)
Number of colleges accredited by the NAAC and scoring above 60 per cent	2,506 (17.9)

Source: MHRD

More Talented Students in Maths and Science

Introduction

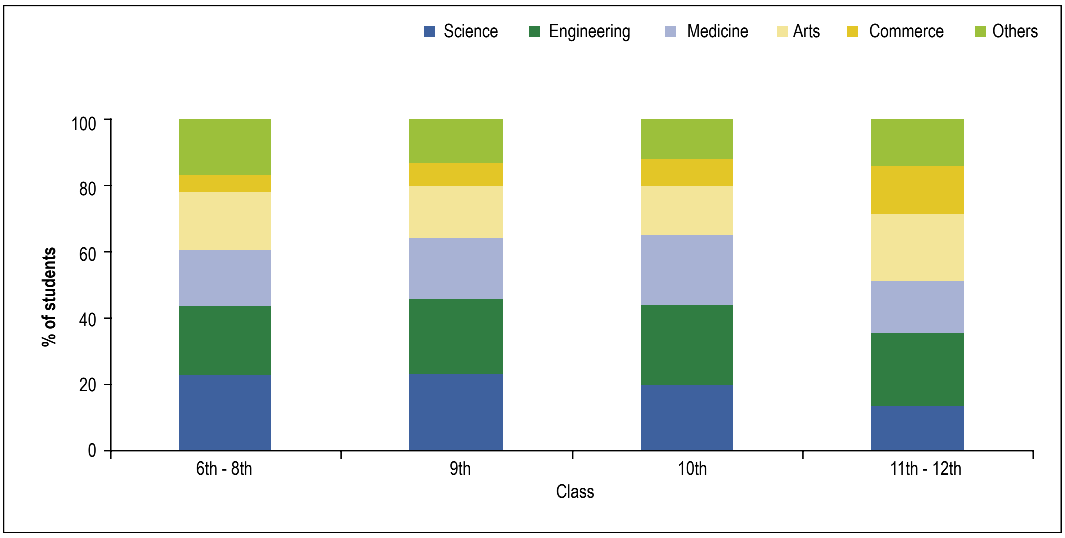
As India seeks to establish itself as a knowledge superpower, it is essential for it to build on its science and technology base. Pure sciences has a critical role to play in this – a strong foundation in science helps in building excellence in technology, propelling economic growth and prosperity, and consequently raising living standards. While India has had a rich heritage in abstract thinking and scientific discoveries, of late the progress in this field has been on the decline. It is increasingly felt that with the popularity of arts, commerce and professional courses, and more lucrative opportunities in related professions, there has been a decline in students studying pure mathematics and science. In order to create a critical base of scientific professionals in the country it is necessary that immediate steps be taken to attract more quality students in mathematics and science.

Current Scenario

School level: While science dominates as the most preferred subject at the middle school level (class 6-8), it becomes less popular at the higher secondary level (class 11-12). In a science survey conducted by the NCAER, 22 per cent of the class 6-8 students said they would like to study pure science in the future. Yet, at the level of class 11 and 12, only 13.4 per cent of the surveyed students wanted to study pure sciences at the graduate/postgraduate level. This percentage is lower than the figure for other disciplines – engineering, medicine, arts and commerce.

Further, the number of students opting for science after the secondary school stage has dropped from 32 per cent in the early 1950s to 19.7 per cent in recent years. More significantly, while in the 1950s, the brightest students entered science, the current science students often take it as a last resort. This indicates that young students, particularly the brighter ones, are drifting away from science. For instance, as reported by Homi Bhabha Centre for Science Education (HBCSE), very few students selected for Olympiads in Physics, Chemistry or Biology went on to opt for higher education in basic sciences. The choice of the National Talent Search awardees also reflects this trend in recent years. Of the 750 awardees, only about 100

Figure 21: Preferred subject for higher education by level of students (2004)



Source: India Science Report, National Council of Applied Economic Research opted for science and only 15 to 20 of the awardees pursued science to the post-graduation level.

Further analysis of the reasons behind why students take science or choose not to take science at higher secondary level reveals that passion for science is the primary decision factor. Not surprisingly, 'better job opportunities' is the second most important reason for taking up science at higher secondary level. Peer pressure, the changing socio-economic situation, and market mechanisms have resulted in the drift of students away from basic sciences to professional courses which lure the student pool with high salaries. (See Tables 13 and 14)

Table 13: Reasons for taking admission in science

Reason	Percentage of science students (Class 11 & 12)
Interested in science subjects	66.6
Better job opportunities	20.4
Parents' desire	3.3
Interested in doing research in science	1.8
Influenced by the work of scientists	1.3
Quality of science teachers is very good	0.8
Influence of peer group	0.7
Intend to go abroad	0.2
Others	4.8

Source: India Science Report, National Council of Applied Economic Research

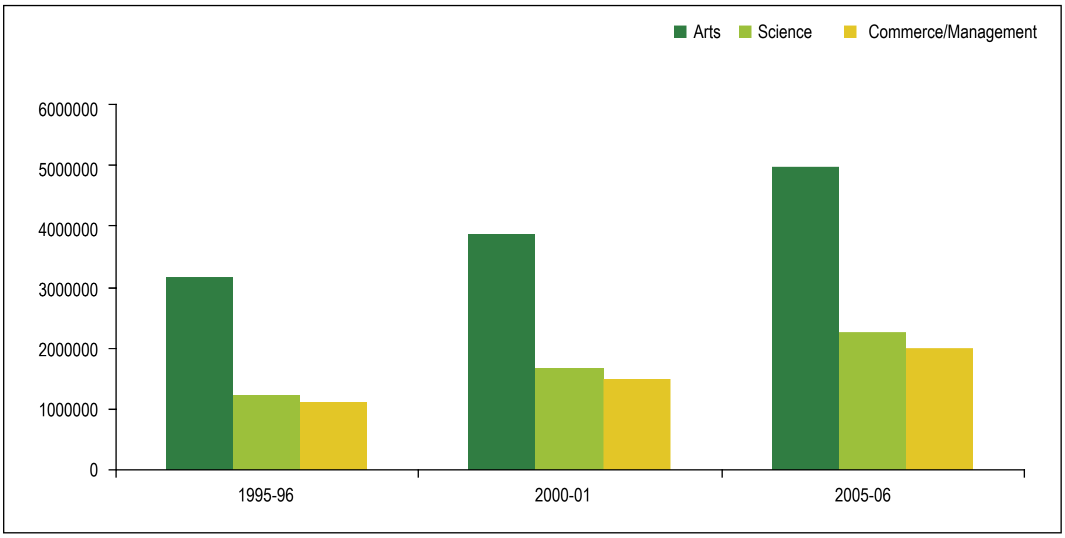
Table 14: Reasons for not taking admission in science

Reason	Percentage of non-science students (Class 11 & 12)
Not interested in science subjects	44.5
Difficult subject	20.4
Higher studies are costly	9.9
Interested in commerce	5.4
Like art subjects	4.8
No future opportunities	2.1
No science college nearby	2
Difficult to get through competitive examination	1.1
Poor quality of teaching at school	1.1
Others	8.9

Source: India Science Report, National Council of Applied Economic Research

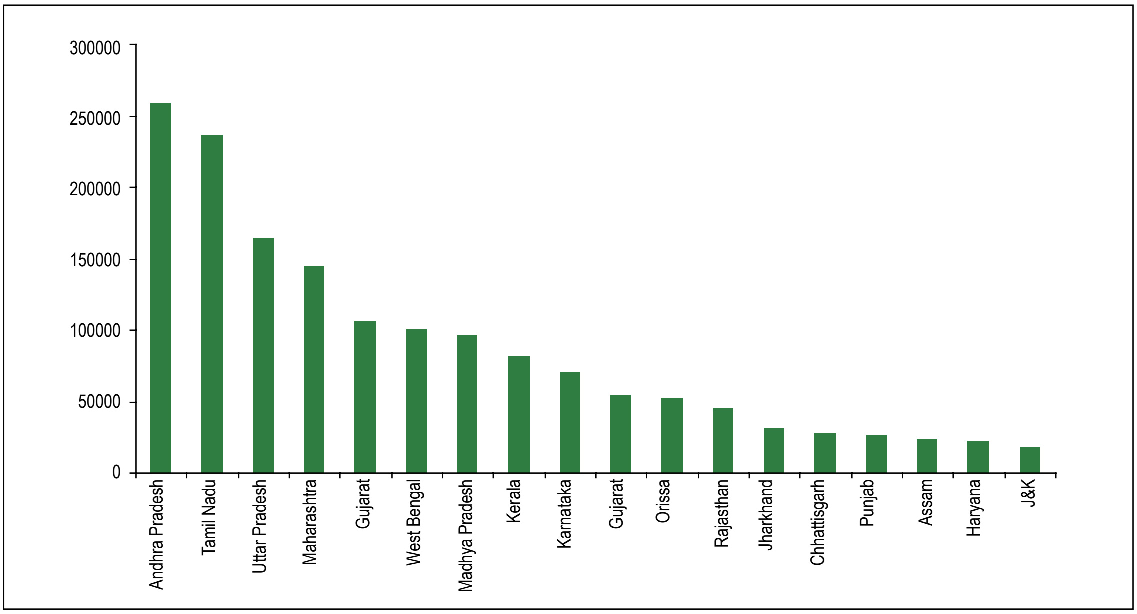
Higher education: Approximately 2.25 million students were enrolled in science in 2005-06 (UGC) – accounting for 19 per cent of the total enrolment in higher education. The number in absolute terms is not small. The stock situation in 2004 was also good. About a fourth of those qualified to the level of graduate and above had a background of science education. There are 8.74 million graduates in all (22.3 per cent of total graduates), 1.8 million postgraduates (19.4 per cent of total post graduates), and 0.1 million doctorates (one-third of total doctorates) in science. However enrolments in pure science and mathematics have not grown as much as in professional fields. Even the number of students from India going abroad to

Figure 22: Gross enrolment in higher education



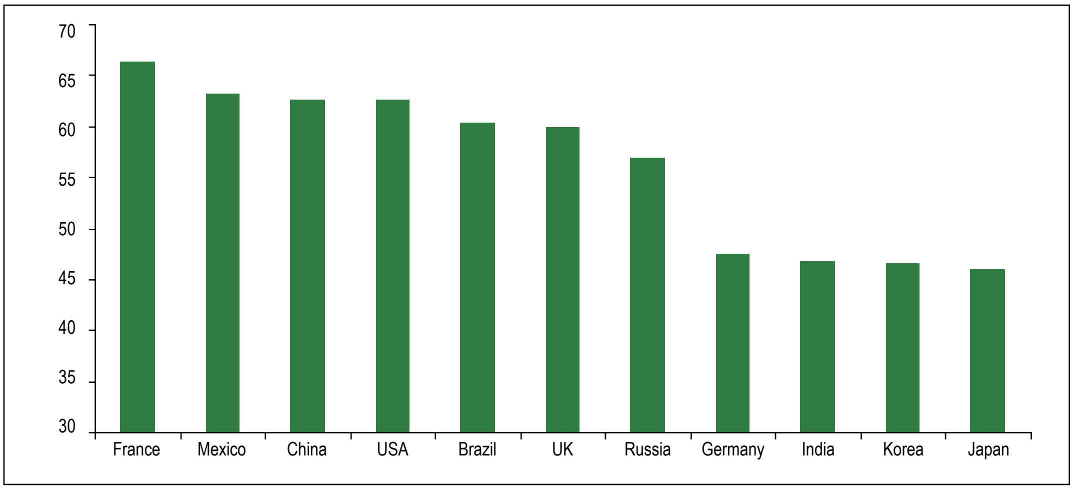
Source: UGC

Figure 23: State-wise enrolment in science (2000-01)



Source: University Development in India, 1995-95 to 2000-01, UGC

Figure 24: Science and engineering doctoral degrees as a percentage of all doctoral degrees in selected countries



Source: NSF, Science and Engineering Indicators 2004, Appendix table 2-36

pursue maths and science has fallen. According to MHRD figures, there has been an absolute decrease of 33 per cent in the number of students going abroad in the science stream (between 1991 and 1998) while the numbers in banking, technology, commerce and management have increased considerably. This could be a result of shift in student interest to pursue courses which have better career options than science.

There is also a striking regional imbalance in enrolment in science with Andhra Pradesh and Tamil Nadu having much larger students taking up science than in the other states.

Research: While research in all areas requires attention, the condition of science is particularly dismal. The absolute number of science graduates is not small but the number of doctorates in science stream leaves much to be desired. According to 2005-06 UGC figures, science doctoral students formed only 1.1 per cent of the graduate enrolment in science. While most advanced countries have more than 60 per cent of total doctoral degrees in science and engineering fields, India has only 46 per cent doctorates in science and engineering (See Figure 24).

The declining interest in science and mathematics needs to be addressed comprehensively. Issues relating to pedagogy, evaluation, curriculum, careers, and infrastructure need to be tackled effectively. Large scale science popularisation programs could also re-establish the passion science once generated.

Legal Education

Introduction

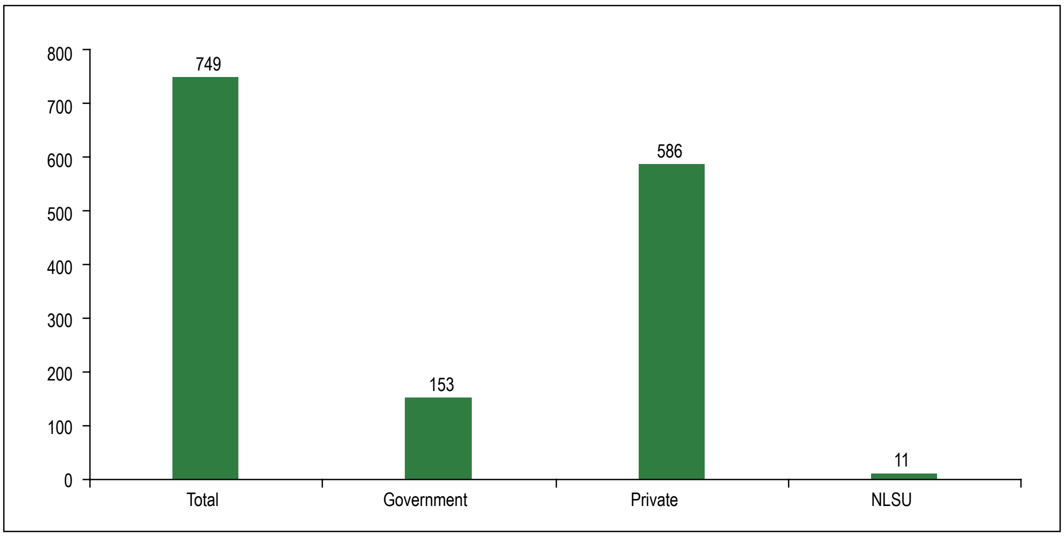
Legal Education as an aspect of professional education has assumed considerable significance, not only in terms of the historical utility of law in society but also in the current context of globalisation. Legal education is a vital link in the creation of knowledge concepts as well as in the application of such concepts in society. The need for trained law personnel in academia, litigation, corporate practice, government and civil society has increased significantly over the last few years and it is estimated that the demands for such trained personnel will rise far more exponentially in the years to come. There is therefore a need to articulate a clear long term vision on legal education in India.

Current Scenario

Institutions: As in 2006, there were roughly 750 institutions in India imparting legal education. Of these, 153 were government institutions and 586 were private institutions. There were a total number of 11 National Law School Universities (NLSUs).

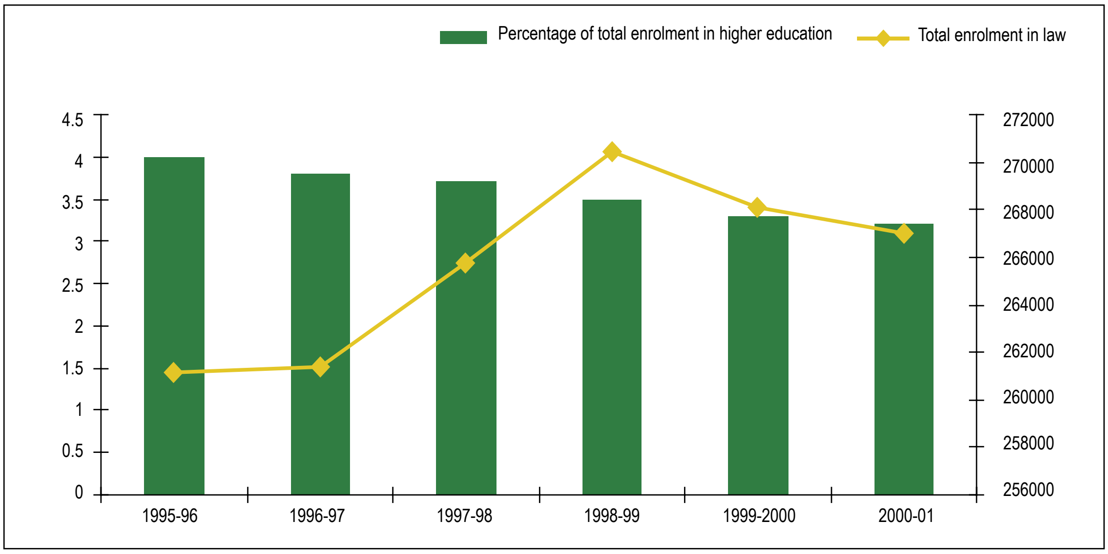
Enrolment: In 2005-06, there were 3.36 lakh students enrolled in legal education in India, accounting for 3.05 per cent of the total enrolment in higher education. Further, a total of 936 students were admitted to the NLSUs in 2006.

Figure 25: Number of institutions teaching law (2006)



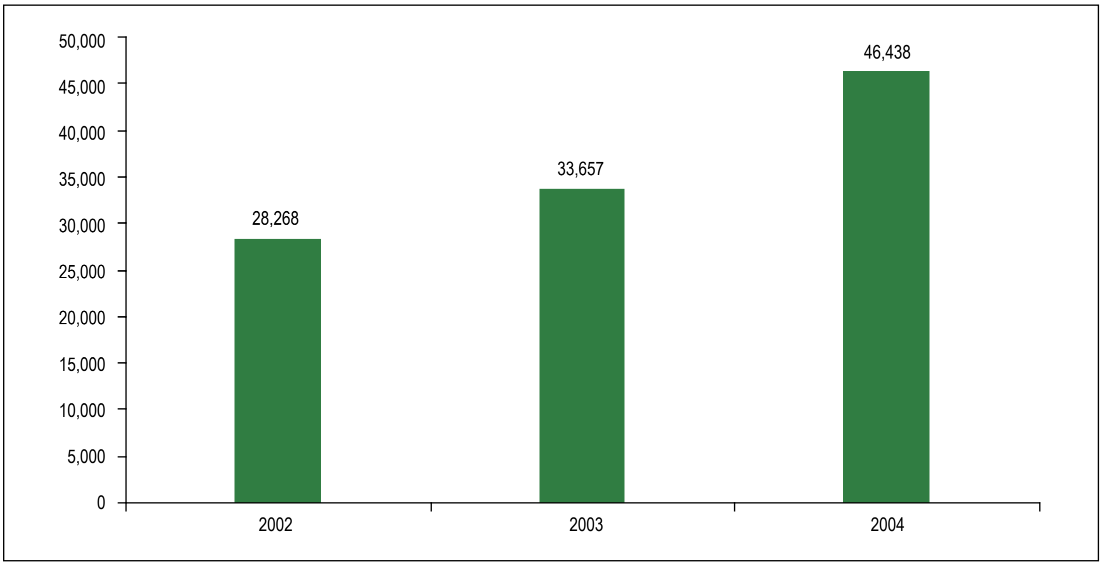
Source: Bar Council of India

Figure 26: Total enrolment in law



Source: University Development in India, 1995-96 to 2000-01, UGC

Figure 27: Total number of law graduates admitted to the Bar



Source: Bar Council of India

Medical Education

Introduction

Assuring a minimal level of health care to the population is a critical constituent of the development process. As a result, the goal and objectives of medical education, its quality and quantity has wide ramifications for human development, health services and build up of intellectual capital for the welfare of the whole country. While medical education in India has expanded in the last 60 years, it continues to remain inadequate given the needs of the country. This is reflected in the shortage of health professionals and health services, with wide disparities between rural and urban areas and also between various states. There is thus an urgent need to expand India's medical education system while keeping issues of quality in consideration.

Current Scenario

Enrolment: The number of students enrolled in medical education has increased by around 85 per cent in the last ten years, from 1,88,187 in 1995-96 to 3,48,485 in 2005-06. However, enrolment in medicine as a proportion to total enrolment in higher education has barely increased – it has changed from 2.9 per cent in 1995-96 to 3.1 per cent in 2005-06.

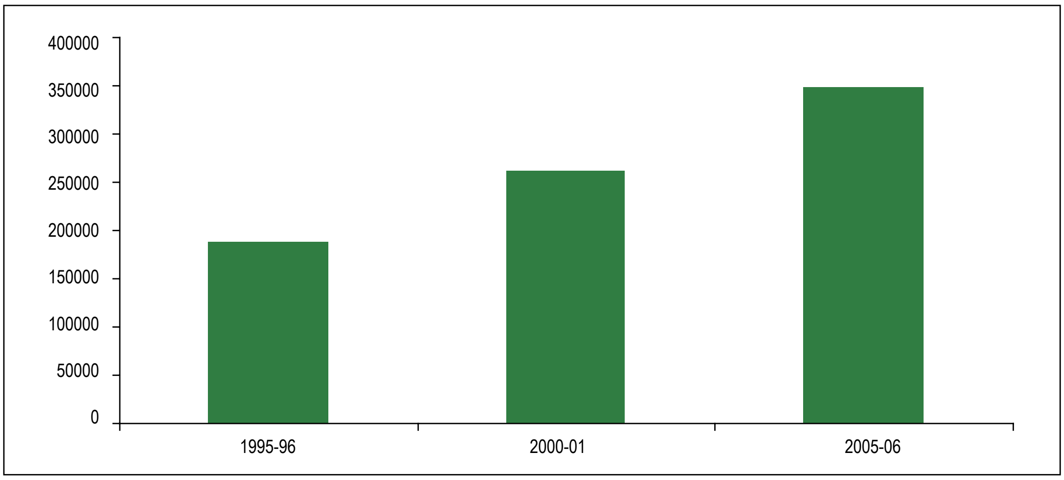
Institutions: The total number of medical colleges (allopathy, ayurveda, homeopathy, unani, dental, nursing and pharmacy) put together stood at 2092 in 2005-06. This was a sharp increase from just 817 medical colleges in 2004-05.

Allopathic Medical Colleges: As of 2006, there were 262 allopathic medical colleges in the country, out of which 174 medical colleges were recognised under Section 11(2) of the IMC Act, 1956 by Medical Council of India. The remaining 88 colleges are permitted under Section 10A of the IMC Act, 1956 for starting MBBS courses. Out of the 262 medical colleges, 131 were government medical colleges, and remaining 131 were private medical colleges. The admission capacity in these colleges is approximately 29,172 students per year. The increase in private medical colleges has been sharp – they grew from 47 in 1995 to 131 in 2006. In the same period, government run medical colleges have increased only from 109 to 131.

AYUSH Medical Colleges: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) colleges have seen a gradual increase in the last five years. (See Figure 31)

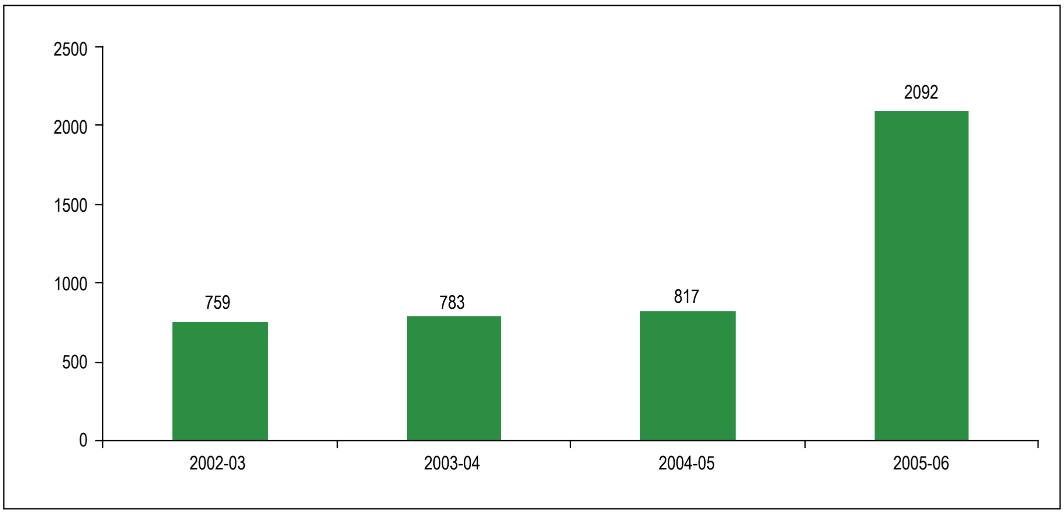
It is a matter of concern that a large number of medical colleges are concentrated in six states (Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala and

Figure 28: Growth in enrolment in medicine



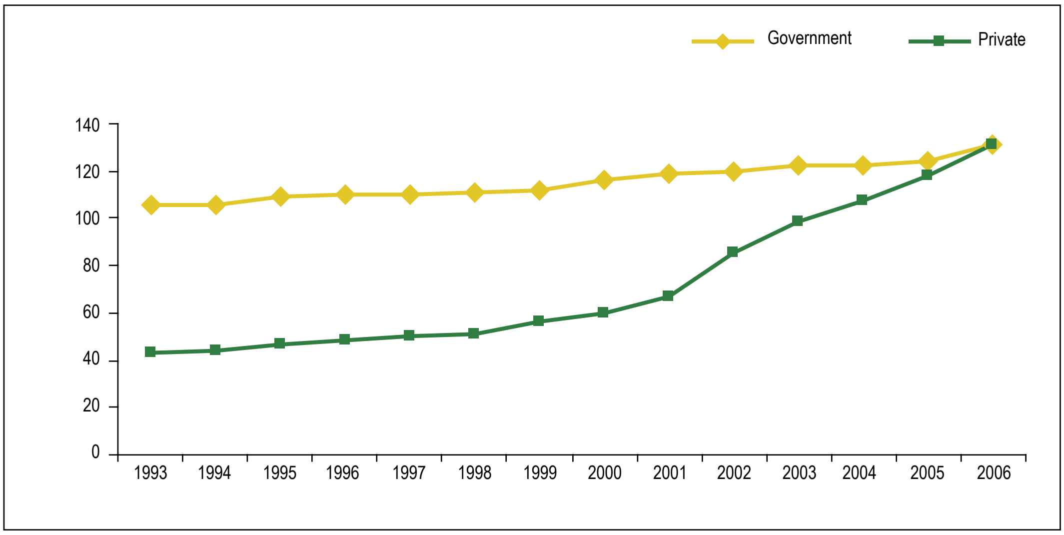
Source: UGC

Figure 29: Growth in medical colleges



Source: MHRD, Selected Statistics 2005-06

Figure 30: Growth in medical colleges – government and private



Source: Medical Council of India

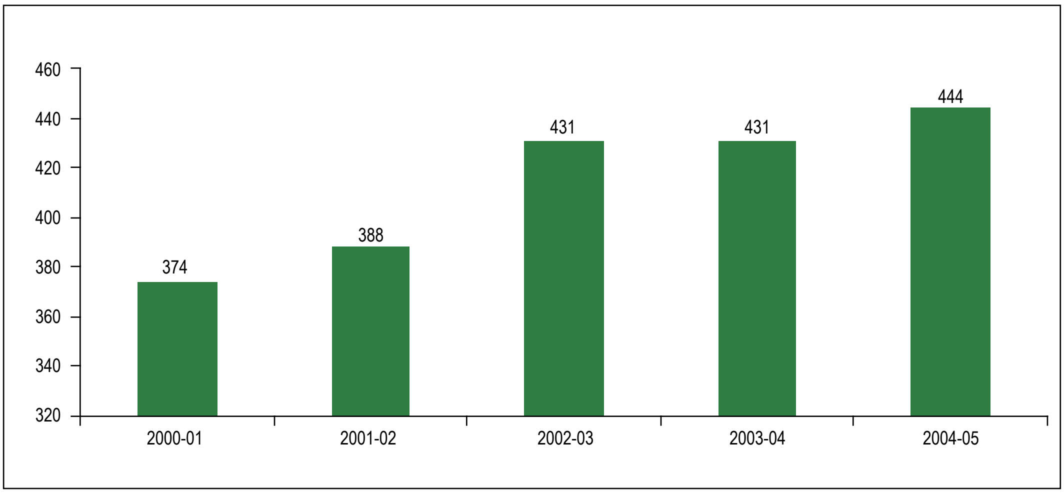
Gujarat). These states cover about 63 per cent of the total number of medical colleges and 67 per cent of the number of seats. In contrast to this, a disproportionately small number of colleges/seats are located in the other states – 20 per cent of the aggregate number of colleges and 18 per cent of the seats in the case of the Empowered Action Group states; and 3 per cent of the aggregate number of colleges and 3 per cent of the seats in the North Eastern/ Hilly states. There is also a rural urban divide with only 30 per cent of the population in the urban areas with 96 per cent of educational institutes here, whereas where more than 70 per cent of the population lives, availability of educational facilities is meager.

Regulation: A plethora of bodies exist to control medical education. Authorities involved include Ministry of Health, Medical Council of India (MCI), UGC, State Medical Education Departments and Councils, Medical Colleges/Institutes, NAMS and NBE (National Board of Examinations). The Medical Council of India (MCI) was established in 1933 and as per Indian Medical Council Act 1933 is the statutory recommending body. The MCI only recognises institutions to start a course and expand it according to laid down criteria under the MCI Act of 1956. With the prior permission of the Government of India, it has no regulatory powers; it is only a recommendatory body. Over the years it has failed to serve the purpose and led to a progressive decline in medical education. The State Medical Education Departments and Councils grant licenses to practice without assessment. Medical colleges largely follow the MCI with no attempt to upgrade or evaluate students or courses.

Quality: There is lack of consistent and regulated standards in medical education with many of the colleges having questionable training capacities and no accreditation system. Medical graduates are often not assessed for clinical skills in accordance with national and international standards. There is lack of appropriate regulation and that further compounds the problem. State governments can grant license to practice general specialty, sub-specialty or super-specialty medicine with no assessment of clinical skills. With roughly 26000 graduates passing out from MBBS every year and only 11-12 thousand postgraduate seats, about 14-15 thousand graduates get into medical practice with theoretical knowledge but no application of knowledge. MCI has neither the power nor the infrastructure to continuously monitor and standards. Major reforms at each level are needed in order to elevate the present condition of medical education in India to international standards.

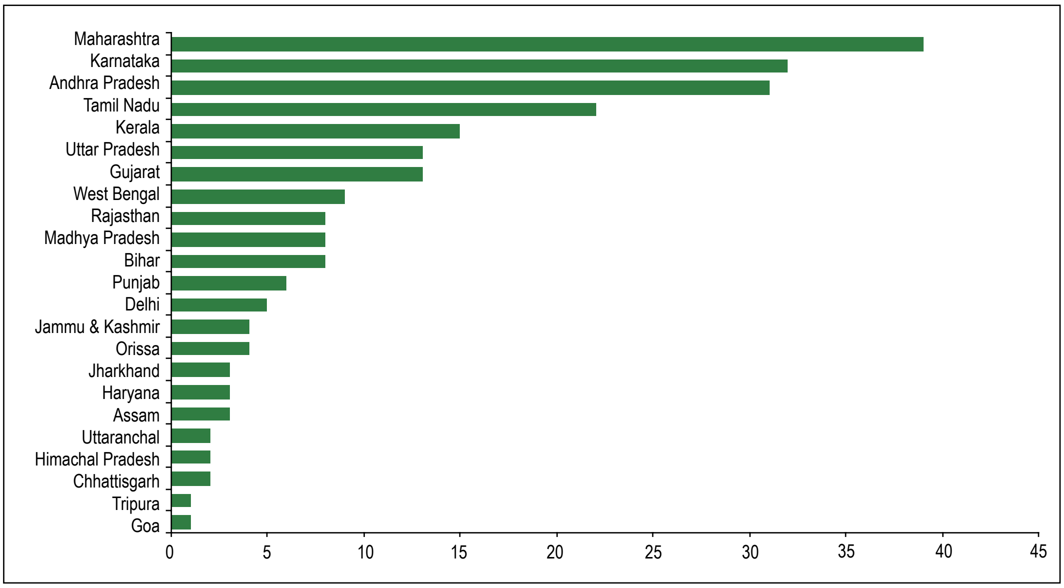
Curriculum: The graduate course is 4½ years with assessments in the 1st year and 2nd year and 2½ years later, by internal and external examiners assessing theoretical knowledge acquired. Skill assessment is limited to a case discussion. Internship is of 1 year duration with no faculty supervision or system of assessment. The graduate acquires unsupervised clinical skills after leaving medical school and before entering general practice. Only about five thousand can get a postgraduate seat and then go through a graded clinical responsibility. It is therefore not surprising that a series of studies conducted by AIIMS and a consortium of 16 medical colleges during

Figure 31: Growth of AYUSH colleges in India



Source: Medical Council of India

Figure 32: State wise distribution of medical colleges (2005)



Source: Medical Council of India

1989-1995 concluded that our medical graduates lack clinical skills. As a follow up to these studies, WHO SEARO conducted a study *General Practice in India, Nepal & Sri Lanka- a status report* (1998) which found the medical care delivered by a sample of general practitioners to be of questionable quality.

Funding: The Central Budget allocation for health which includes medical education has declined from 1.3 per cent of the GDP in 1999 to about 0.9 per cent today. As a percentage share of the Total Central Budget, it has been stagnant at 1.3 per cent, while in the states, it has declined from 7 per cent to 5.5 per cent (National Health Policy 2002). The results from the National Health Account (NHA) for the year 2001-02 showed that total health expenditure in the country was Rs. 1,05,734 crore, accounting for 4.6 per cent of its GDP. Out of this, public health expenditure constituted Rs. 21,439 crore (0.94 per cent), private health expenditure constituted Rs. 81,810 crore (3.58 per cent) and external support Rs. 2,485 crore (0.11 per cent). In nominal terms, the per capita public health expenditure increased from Rs. 89 in 1993-94 to Rs. 214 in 2003-04, which in real terms is Rs. 122. Given these statistics, it is no surprise that the reach and quality of public health services has been below the desirable standard.

Health Services and Medical Personnel: While India has seen considerable improvements in health standards in the last six decades, problems of access to quality healthcare and shortages of skilled medical personnel still persist. As per 2007 figures, India had 6.9 lakh registered allopathic doctors, 7.2 lakh AYUSH doctors, 15 lakh nurses and 6.8 lakh pharmacists. While the absolute number is not very low for a developing country, the numbers prove inadequate in view of India's large population.

Figure 33: Growth of per capital health expenditure by Centre and States

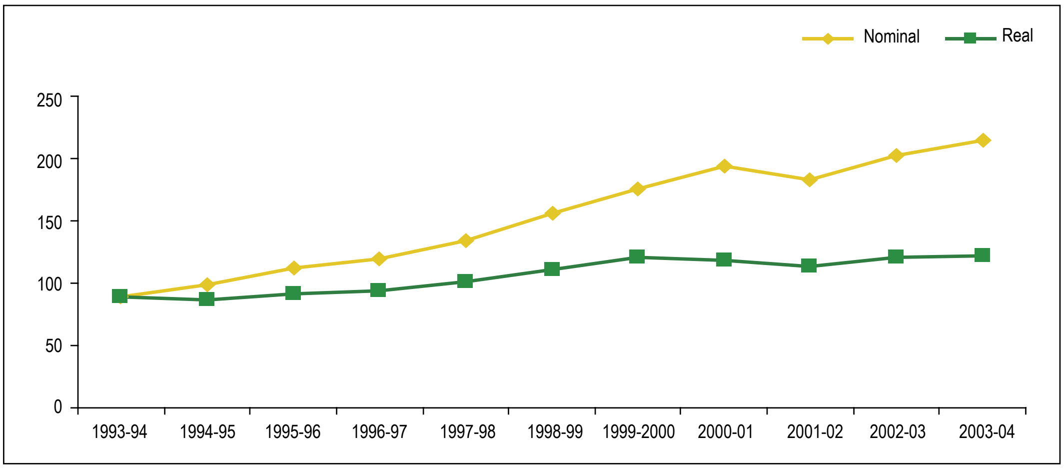
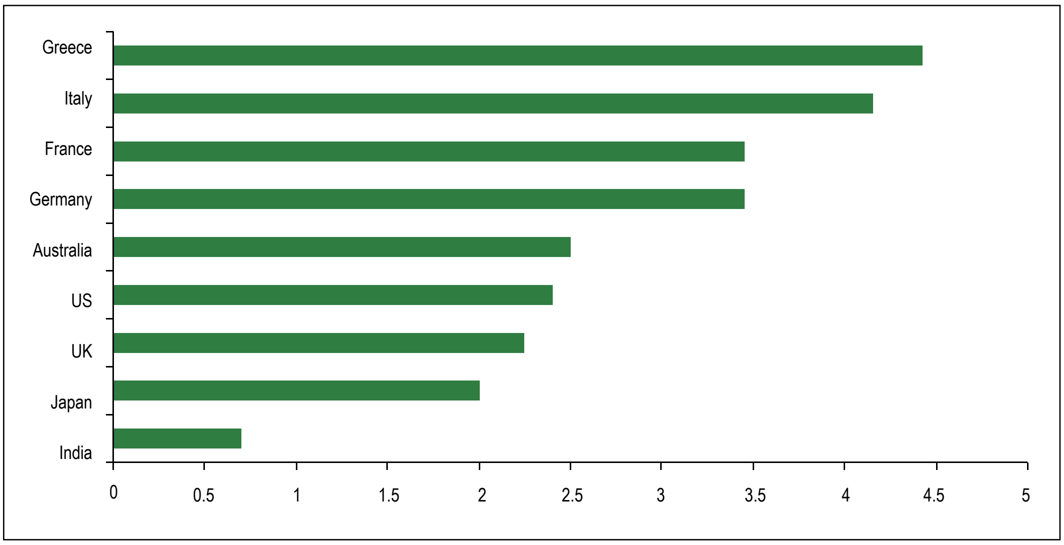


Figure 34: Number of doctors per 1000 population



Source: Journal of Royal Society of Medicine Vol. 99, June 2006

Management Education

Introduction

In recent years there has been an unprecedented number of technical and management institutions being set up, mostly through private capital. In the field of management education, India has around 1200 institutions providing undergraduate and post-graduate level courses. Since the management graduates and post-graduates produced by these institutions are primarily absorbed by industry, there is a growing need to match the curriculum and structure of management education to better fit the needs of India and to the changes in the industrial and services sectors within the country. Moreover, it is important to properly assess the quality of management education imparted to the students of various institutions.

Current Scenario

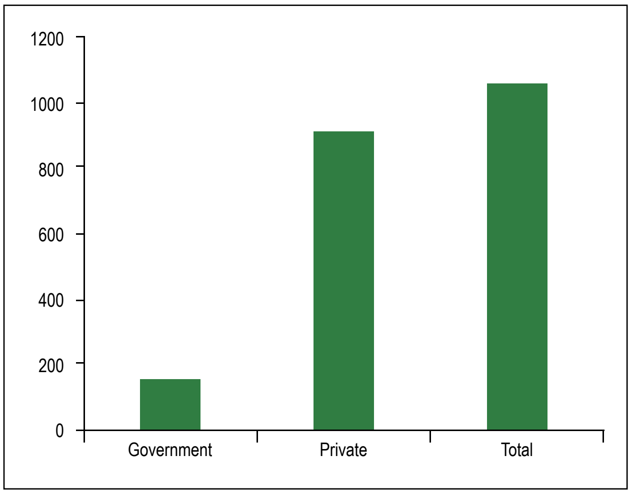
As in 2006-07, there were over 1100 business schools in the country. Of these, 5 were private aided institutions, 903 were private unaided and 149 were government institutions.

In the last decade, the country has witnessed a phenomenal growth in enrolment in management education. The current intake stands at roughly 92,000, with the majority of the students enrolled in private management colleges.

The distribution of management institutions shows a regional imbalance, with 86 per cent of the colleges concentrated in north and south India. There appears to be a correlation between the number of schools in a state and its economic and industrial development. The regional imbalances in development and the creation of capacity for management education in the state are probably related.

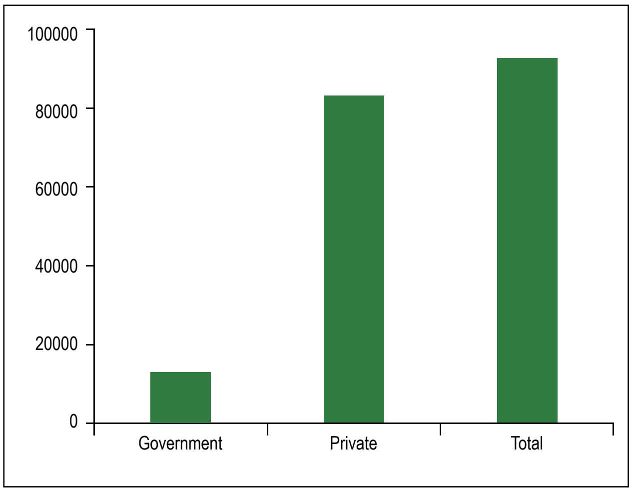
A large proportion of the capacity is filled through all-India examinations conducted at a number of locations throughout the country. Therefore, a high per capita seat capacity for a state does not necessarily mean a higher

Figure 35: Number of management institutions (2006-07)



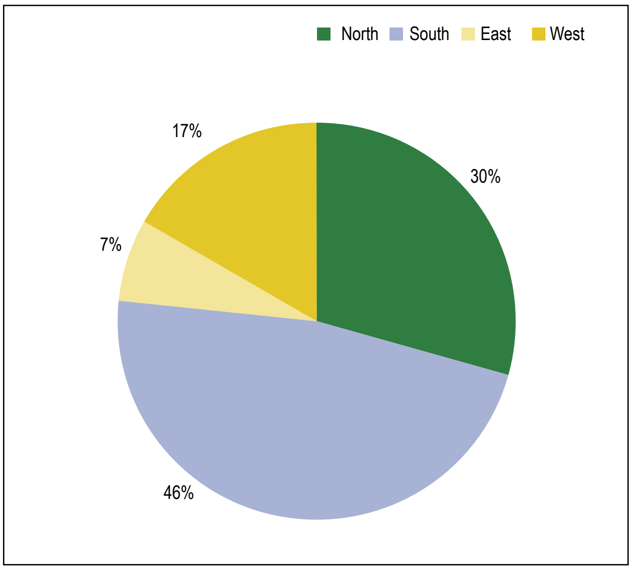
Source: MHRD

Figure 36: Intake in management colleges (2006-07)



Source: MHRD

Figure 37: Regional distribution of management colleges (2006-07)



Source: MHRD

level of opportunity for aspirants from that state. The per capita seats per lakh of population may be partly a reflection of the state's capacity to absorb a higher percentage of management graduates.

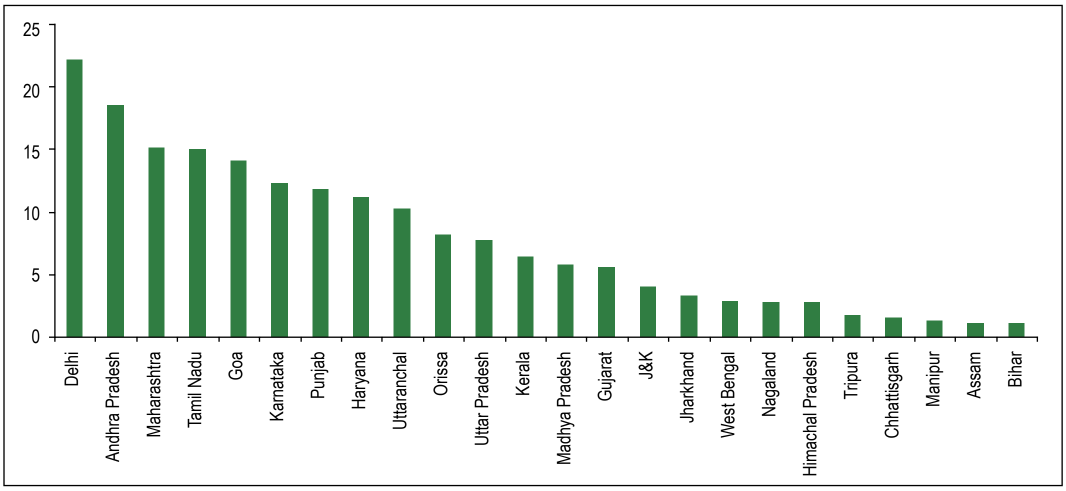
Growth in the number of business schools has accelerated over the last two decades. This acceleration, propelled by the increase in the rate of growth of the Indian economy, speaks also for the entrepreneurial initiative of promoters to seize commercial opportunities in education. The imbalance between demand and supply for management graduates has led to an overly commercial and exploitative environment in management education. It is not clear how many of the recently started institutions are merely speculative and how many are seriously committed to the cause of management education. It is not also clear how many actually meet the norms and standards established by the All India Council for Technical Education. The regulatory framework and implementation has been unable to link the entrepreneurial initiative to performance in terms of educational quality. It has a control perspective focusing on inputs such as land, faculty, and other infrastructure rather than on the outcomes such as quality of education, research, access, cost effectiveness or relevance.

Table 15: Growth of business schools in India during 1950-2006

Period	No. of Business schools added	Average annual addition
1950-80 (30 years)	118	4
1980-1995 (15 years)	304	20
1995-2000 (5 years)	322	64
2000-2006 (6 years)	1017	169

Source: Adapted from Dayal, I., "Developing Management Education in India", *Journal of Management Research*, 2(2), August 2002, page: 101.

Figure 38: State-wise MBA/PGDBM seats per lakh population (2006)



Source: Report of the Working Group on Management Education, National Knowledge Commission

Engineering Education

Introduction

With economic growth and the spread of technology, the demand for engineers has increased manifold. This has been matched by an increase in enrolments in engineering as well as rise in number of engineering institutes in India. However keeping in mind the growing opportunities for engineers, particularly in the field of information technology and business process outsourcing, there is scope for further expansion. A NASSCOM report foresees a shortage of 500,000 knowledge workers by 2010, 70 per cent of which would be in the BPO industry. At the same time, the quality of engineering institutes and engineering graduates needs to be improved. Apart from a few elite institutes, engineering education in India is often seen as outdated and irrelevant. Most graduates do not possess the requisite skills, and industries have been facing a consistent deficit of quality trained engineers. Also, most institutes, including premier institutes, fail to attract and retain quality faculty. These deficiencies in engineering education need to be tackled immediately to ensure that India does not miss out on significant opportunities.

Current Scenario

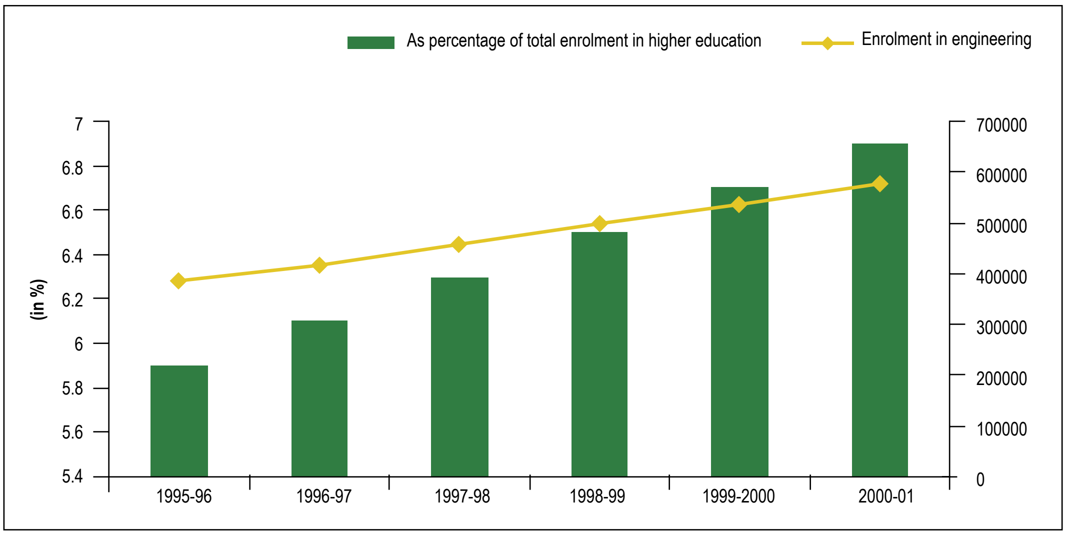
Enrolment: Enrolment in engineering education has seen a rapid increase in the last decade. The total enrolment in 2005-06 stood at 795120 – accounting for 7.21 per cent of the total enrolment in higher education.

Institutions: There has been a phenomenal growth in the number of engineering institutions at the graduate level, from 158 in 1980-81 to 1512 in 2006-07. A major reason for this explosive growth in the last decade has been the entry of private (aided as well as self financing) institutions. With the growth in demand, the average sanctioned intake per institution has also increased with time.

The investment from private sector has had a large role to play in the growth of institutions. However, the quality of these many of these private institutions is suspect. This has also been a major reason for the creation of a regional imbalance in the country.

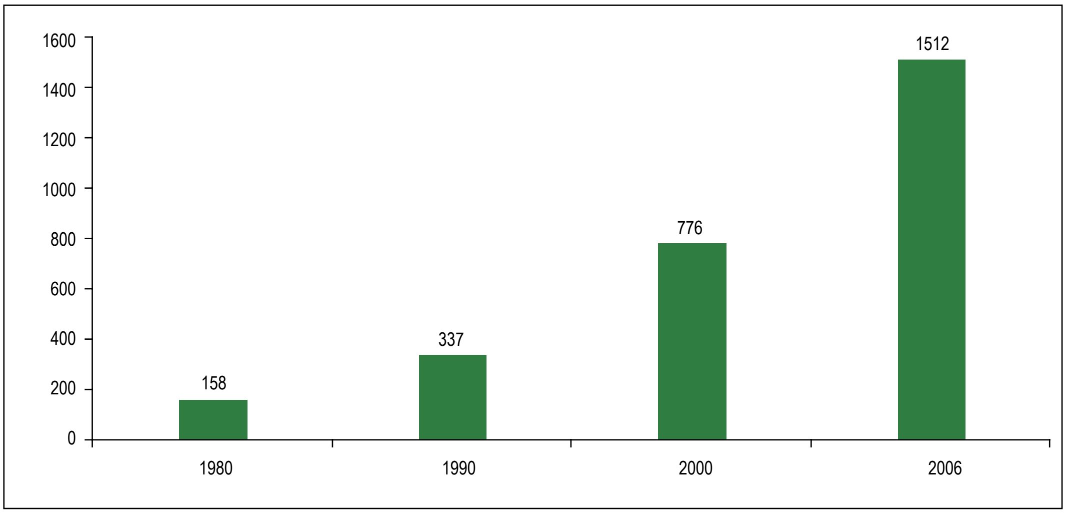
Regional imbalance: Although the number of engineering institutions is more than 1500 at present,

Figure 39: Time series trend in engineering enrolments



Source: University Development in India, 1995-96 to 2001-01, UGC

Figure 40: Growth in engineering institutions



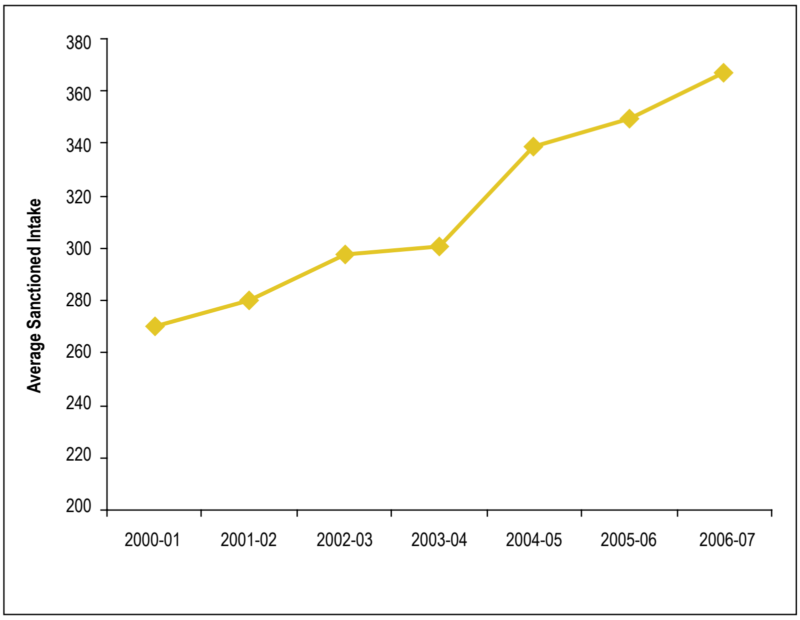
Source: UGC

data on the region-wise distribution of institutions and sanctioned intake of students indicates regional disparity. On one hand, where there are around 268 institutions in the southern region, there are only 9 institutions in the eastern region. At the extreme end of the spectrum, Nagaland, Andaman and Nicobar, Daman & Diu have no engineering institutions at all. Out of the seven Indian Institutes of Technology, three (Delhi, Kanpur and Roorkee) are located in the North, two in the East (Kharagpur and Guwahati) and two in the South (Chennai and Mumbai).

Faculty: The rapid growth of engineering institutions and the inadequate supply of teachers together have created a shortage of faculty across engineering disciplines and institutions. India has a faculty strength of around 67,000 in engineering. According to the AICTE Review Committee Report 2003, the increase in the sanctioned number of student intake has led to an escalation of faculty requirements of about 95,924. This indicates a shortfall of over 26,000 engineering doctorates and 30,000 engineering postgraduates for meeting the teaching requirements.

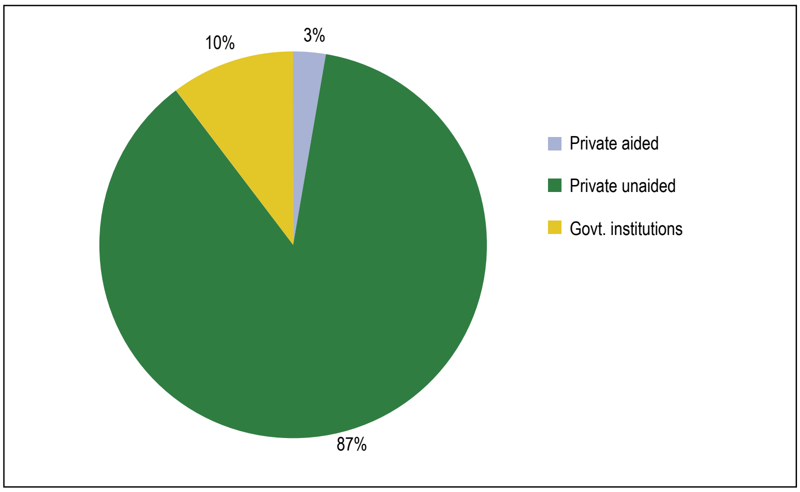
Quality: Engineering education in India has a pyramidal structure, with a few elite institutions at the peak and a large proportion of institutions at the bottom of this pyramid. Flexible institutions, world

Figure 41: Average sanctioned intake per institution



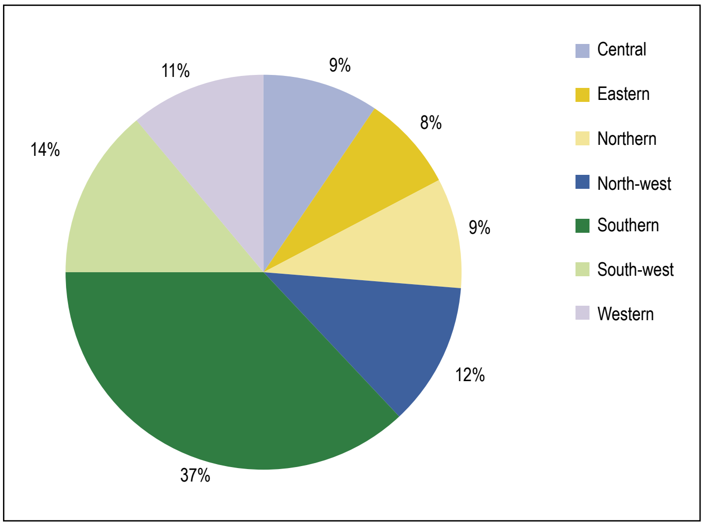
Source: AICTE

Figure 42: Share of institutions by intake (2006-07)



Source: AICTE

Figure 43: Region-wise distribution of engineering institutions in 2006-07



Source: AICTE

class infrastructure, relevant curriculum, good faculty and industry linkages are crucial inputs needed to enhance quality of engineering education in India. Current engineering graduates are often found to be ill-equipped to meet the skill demands of the industry – a survey by the McKinsey Global Institute showed that multinationals found only 25 per cent of Indian engineers employable.

Research: Postgraduate education in engineering and technology had a late start in our country. At the time of India's independence only 6 institutions offered postgraduate programs in engineering and technology to just about 70 students. In 2003, 1552 postgraduate engineering programs were recognised in engineering, offered by 321 institutions with a total sanctioned intake of over 26,000. In 2004-05, only 968 doctorate degrees were awarded in engineering, the majority of which came either from the Indian Institutes of Technology or the Indian Institute of Science, Bangalore.

Open and Distance Education

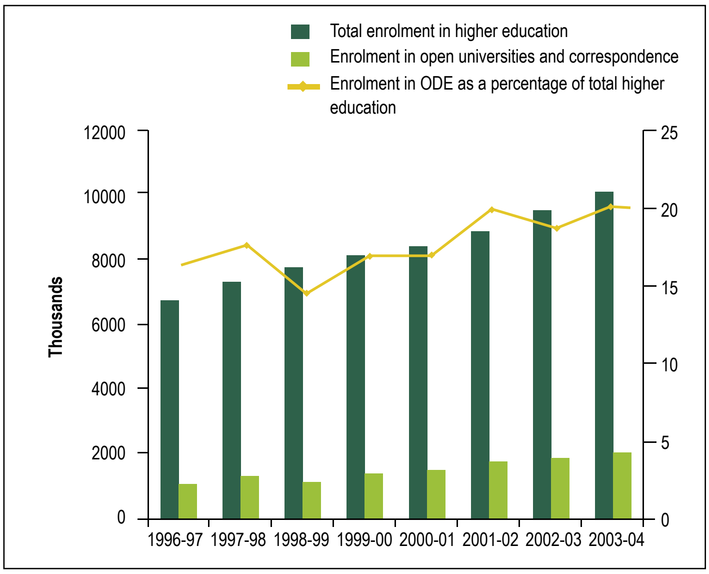
Introduction

Distance education is provided by open universities and correspondence courses offered by Distance Education Institutions (DEIs) of conventional universities. Almost one-fifth students enrolled in higher education in India are receiving education through the distance mode, i.e. through the open universities or though the correspondence courses of traditional universities. Given the rapid expansion required in higher education in India, open and distance education can play an extremely significant role in meeting the increased demand for higher education. Moreover, there is an unprecedented opportunity with regard to technology especially in the form of open courseware. However, problems relating to quality as well as brand equity of distance education persist.

Current Scenario

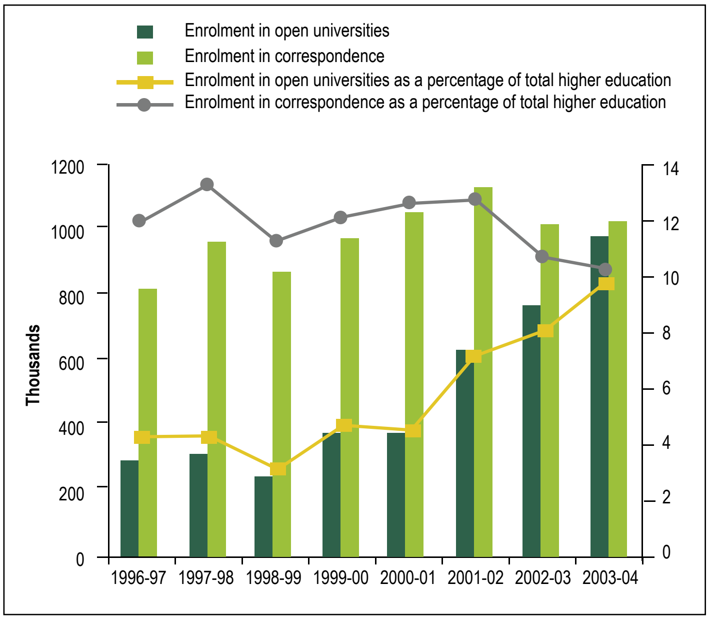
Enrolment: In 2004-05, around eleven million people were enrolled in higher education in India, of which the open and distance education system (including correspondence courses offered by distance educational institutions (DEIs) of conventional colleges) served roughly 20 per cent. Within this, open universities served 10 per cent of the higher education need. The figure below illustrates the growth in enrolment in higher education and open and distance education from 1996 to 2004. In 2000-01, only 4 per cent of the higher education need was served by open universities, but in 2003-04 the figure was around 10 per cent, while the overall distance education contribution is around nineteen per cent. The figure below also shows the contribution to distance education by open universities and by correspondence courses of conventional universities.

Figure 44: Contribution of Open and Distance Education (ODE)



Source: MHRD

Figure 45: Enrolment in open universities and correspondence courses



Source: MHRD

Institutions: In India there are 14 open universities – 13 state open universities and one national Open University – Indira Gandhi National Open University (IGNOU). IGNOU now has a cumulative enrolment of about 15 lakh, offers a total of 126 programs and has a teaching staff of 325 and 1157. Distance education through correspondence courses is provided by other regular universities as well. As on date there are 119 Correspondence Course Institutes (CCIs) in conventional Universities. In 2003, open universities served only eight per cent of the total higher education enrolment, while correspondence courses constituted nearly one fifth of the total higher education enrolment.

Quality: The quality and delivery mechanisms of distance education provided by correspondence courses are relatively poor. Most correspondence courses are instituted as a mode of resource generation in view of the unmet demand for higher education. Further, the resources thus earned are not used for the improvement of the correspondence programs. Therefore, quality concerns become secondary to those of numbers and income. Due to inadequate mechanisms of quality control and regulation, students graduating from both regular courses and correspondence courses get the same degree, despite sharp differences in quality of pedagogical process and achievement. Substantial investments in

Table 16: Enrolment in open universities and correspondence courses (1996 to 2003)

Year	Total enrolment in higher education	Enrolment in open universities	Enrolment in open universities (% of total)	Enrolment in correspondence	Total enrolment in open & distance education
1996-97	6842598	294947	4.31	819110	1114057
1997-98	7260418	316089	4.35	959228	1275317
1998-99	7705520	247168	3.21	868459	1115627
1999-00	8050607	381862	4.74	971991	1353853
2000-01	8399443	379286	4.52	1055317	1434603
2001-02	8821095	632214	7.17	1123344	1755558
2002-03	9516773	765489	8.04	1012779	1778268

Source: Department of Secondary & Higher Education, MHRD

Table 17: Enrolment and teachers in open universities in India (2003-2004)

Open University	Enrolment	Students on Roll	Teachers	Budget#	Revenue Receipts*
Indira Gandhi National Open University, New Delhi	334315	1187100	307	21170	13950
Dr. B.R. Ambedkar Open University, Hyderabad	190320	-	89	3320	2730
Vardhaman Mahaveer Open University, Kota	5999	-	30	355	390.5
Nalanda Open University, Patna	1805	8484	6	948	95.95
Yashwantrao Chavan Maharashtra Open University, Nashik	102642	800587	39	2189	1600
Dr. Babasaheb Ambedkar Open University, Ahmedabad	13824	68865	39	-	-
Madhya Pradesh Bhoj Open University, Bhopal	192230	192230	36	121.5	1129.04
Netaji Subhas Open University, Kolkata	14734	225244	4	310	175
Uttar Pradesh Rajarshi Tandon Open University	8025	22172	11	-	-
Karnataka State Open University, Mysore	19580	33172	63	46	1156
Tamil Nadu Open University, Chennai	9361	9361	20	192.9	192.9
	#Budget plan + non plan			* in Rs Lakh	

Source: Distance Education Council

correspondence courses must be made by universities to improve resources, delivery and modes of pedagogical assistance and assessment.

International comparisons: Most of the developing countries worldwide have realised the need for open universities. Developed countries such as France and UK have pioneered open and distance education. United States remains the undisputed leader in online education. Table 18 below lists *mega* open universities of the world, along with enrolments and budget.

Issues in the Current Framework

1. The same form and structure of degree programs: Open and distance education imparted in open universities system has evolved alternative delivery modes with a lot of flexibility. However, it has retained the same form and structure, eventually culminating in a degree or diploma certification. Though this is followed to retain recognition from employers and acceptance from society, it has not made the system responsive to the dynamic developmental needs of the people.

2. Limited linkages with the workplace: The emphasis on people's education with a focus on work related skills and productivity as expected in the Report of Education Commission (1964-66) on Education and Development is yet to be achieved and built into the open and distance education system. Linking education with productivity demands linking learning with workplace based training and education for value addition.

3. Limited coverage and access: Although the existing size and the share of the open and distance education system in higher education is significant, it is still too small to support life-long learning for the citizens of the country.

4. Lack of access to media: Study texts form the main study materials for a large majority of students. Pedagogical use of various electronic media is yet very limited.

5. Lack of coordination: There is an overlap of target groups to be covered by the open schooling and open and distance higher education. The latter is for mature adults and many open universities have reduced the age criteria from 21 years to 18 years to enable open admission for preparatory courses essential for admission to open degree programs, for those who have not class twelve graduates. Since open schools also cater to mature adults, it is essential to have coordination amongst the school and higher education programs to cater to diverse needs of mature adults.

Table 18: Open and distance education in other countries - mega universities

Country	Institution	Enrolment	~Budget in Million US$		Unit Cost*
Pakistan	AIOU	456,126			
Turkey	Anadolu	1,187,100	32.4	budget for 2000	10
China	CCRTVU	2,300,000			40
France	CNED	184,614	56.0	1995 figure	50
India	IGNOU	1,187,100	47.0	budget for 2004	35
Korea	KNOU	196,402	> 79.0	1995 figure	5
UK	OU	203,744	> 300.0	1995 figure	50
Thailand	STOU	181,372	> 46.0	1995 figure	30
Indonesia	UT	222,068	> 21.0	1995 figure	15

* Unit cost per student as a percentage of the average for other universities in the country

More Quality Ph.Ds

Introduction

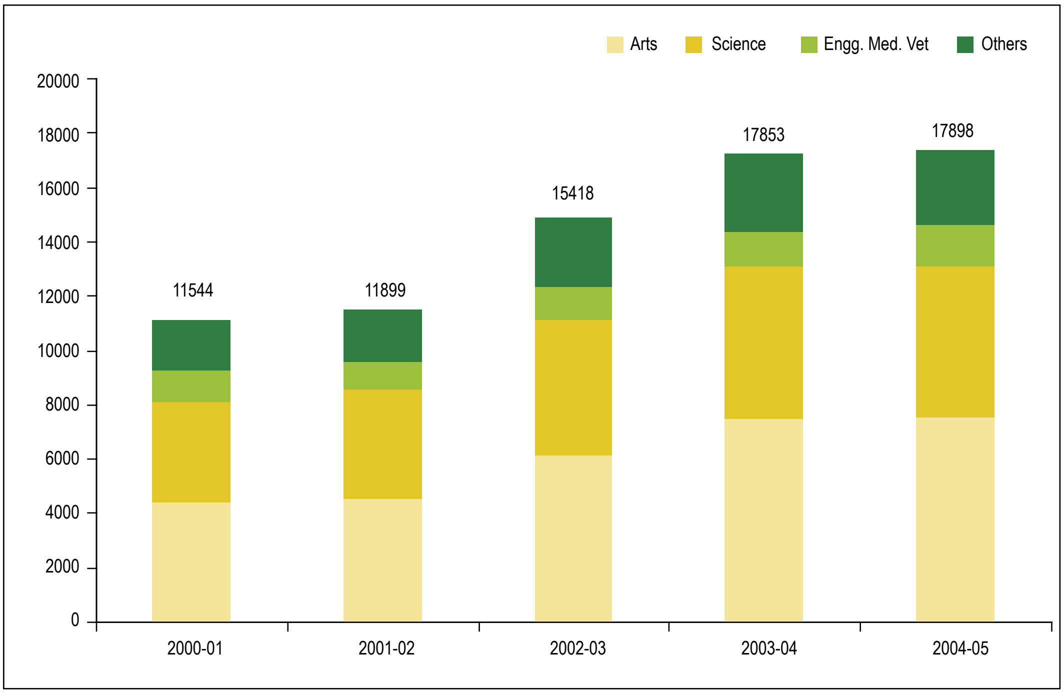
As India seeks to transform itself into a knowledge society, reviving the culture of research and innovation becomes all the more important. High quality research in all frontiers of knowledge is essential to achieve long term competitive advantage. However, the growth in higher education in India has not been accompanied by an equivalent growth in doctoral students. The declining quality of research work and deteriorating research standards and infrastructure in the country are a cause of concern. Inadequate infrastructure and lack of strong incentives to practice quality research are major causes of decline in interest towards research work. Administrative hurdles add to the already unfavourable environment for research.

Current Scenario

The current quantum of research happening in India is insufficient. Of the 11 million students enrolled in higher education in 2005-06, only 0.64 per cent were enrolled in research programs. Further, out of the 17898 of doctorate degrees awarded in 2004-05, the Faculty of Arts awarded 7532 degrees and the Faculty of Sciences had 5549 degrees. Thus, these two faculties together accounted for 73 per cent of the total number of research degrees awarded. There are also wide disparities within states in the number of doctoral degrees granted.

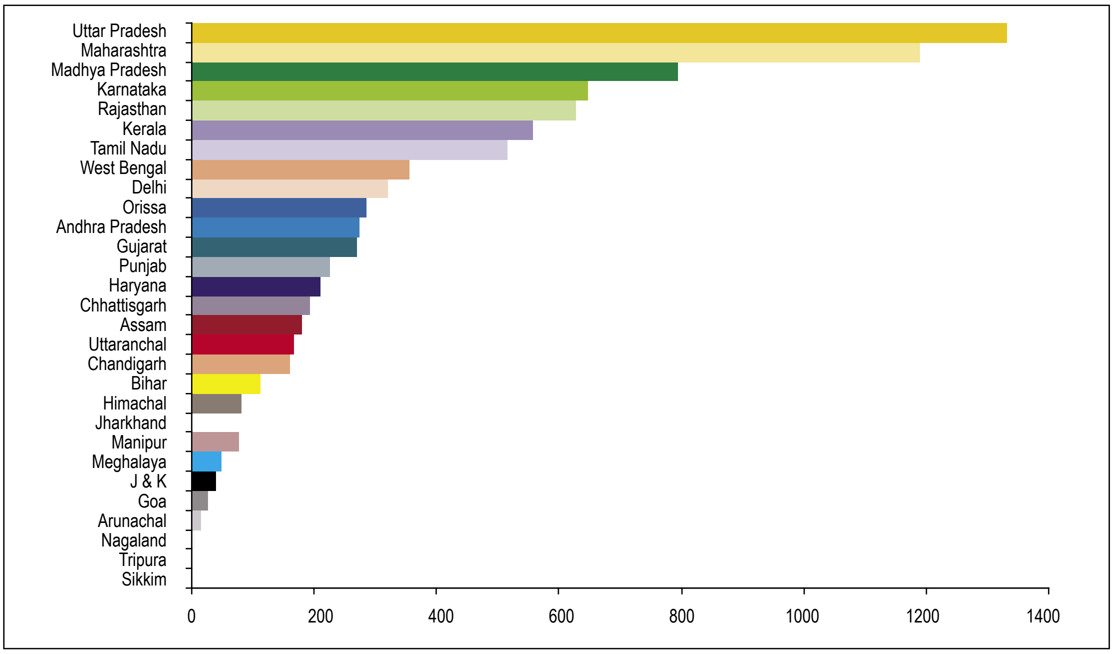
India's poor performance in research is also highlighted by comparisons with other countries. In 2002, USA had 4373, Japan had 5084, Germany had 3208 and even

Figure 46: Growth of doctorates: Faculty-wise number of doctorate degrees awarded



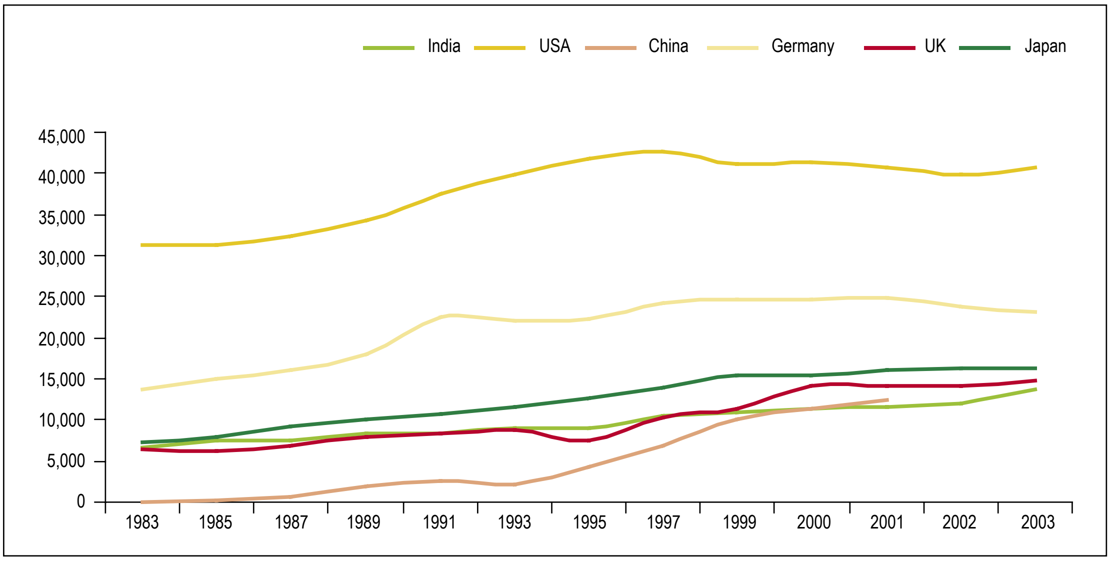
Source: Annual Report, 2005-06, University Grants Commission

Figure 47: State-wise distribution of Ph.D degrees awarded



Source: MHRD, Selected Statistics, 2004-05.

Figure 48: Growth in number of doctorates compared to other countries



Source: NSF, Science and Engineering Indicators 2006, Appendix Tables 2.42 and 2.43

China had 633 researchers per million inhabitants while India had only 112. Similarly, while the number of doctorates increased by only 20 per cent in India, China showed a spectacular growth of 85 per cent in Ph.Ds, Taiwan 57 per cent and Japan 48 per cent between 1991 and 2001.

Further, according to National Science Foundation, USA, the number of Indians who received US doctorate degrees in 2003 in science and engineering is approximately 14000, a figure roughly double for Indian science and engineering doctorates who received degrees in India. Indians also earned by far the largest number of U.S. doctoral degrees awarded to any foreign group in computer and information sciences. This points out to the absence of a conducive research environment in India.

Intellectual Property Rights

Introduction

Intellectual property rights (IPR) have emerged as an indispensable strategic tool in today's knowledge economies and societies, particularly in the context of economic globalisation. An entity's ability to compete in the global market depends to a large extent on its capacity to generate new ideas through innovation in science and technology. IPR, by conferring exclusive monopoly rights to its owner for a limited duration, has emerged as a significant factor in creating incentives for innovation and generation of economic value. An effective IPR system is also a constituent of a reliable legal environment, which in turn becomes an important factor for decisions on foreign investment and technology transfer.

Current Scenario

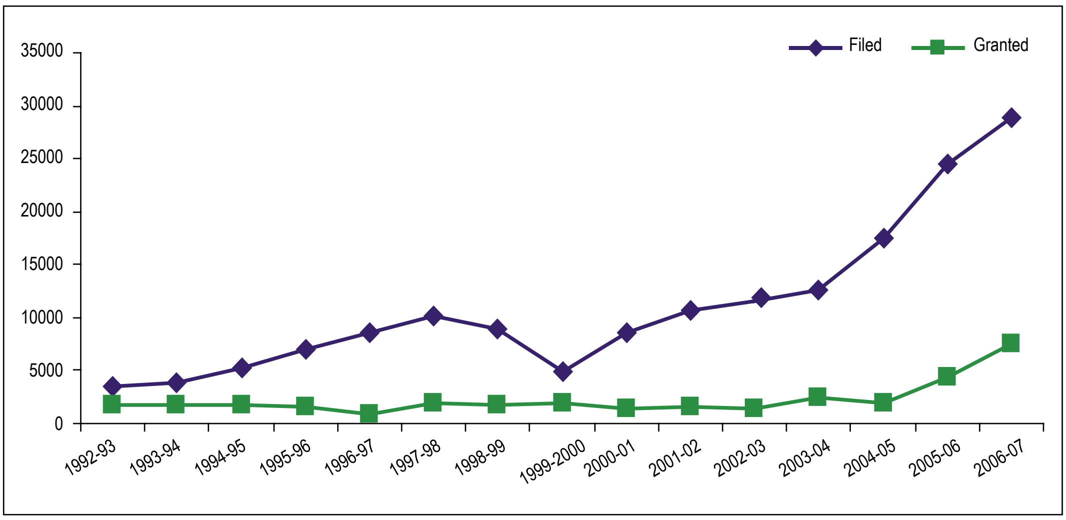
Patent trends: India has witnessed a marked rise in the number of patent applications filed. While in 1992, 3467 applications were filed, in 2006-07, almost 29000 applications were filed. Similarly, number of patents granted has increased – although less rapidly. In the past five years, patent grants have shown a more than five-fold increase.

Further, of the total of 28940 applications in 2006-07, only 18 per cent were filed by Indian residents – the remaining were filed by foreign applicants. This in sharp contrast with countries such as USA, China, France, Germany, Korea and UK, where domestic patent application filing is much higher than foreign applications.

A sector-wise analysis of patents filed in India show that the chemical, mechanical and computer fields rank the highest in terms of number of applications filed. However, the food, biotechnology and electrical industries have seen the highest growth in the last three years.

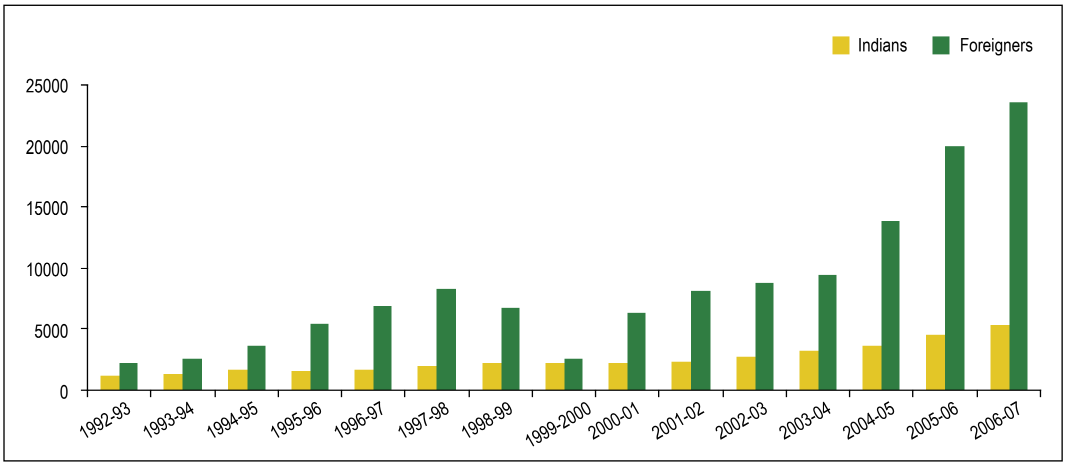
International comparisons: India figures in the top 20 patent offices, both by patent filings and patent grants. Its ranking further improves if one takes into account

Figure 52: Comparative Trend of Patents Filed and Granted



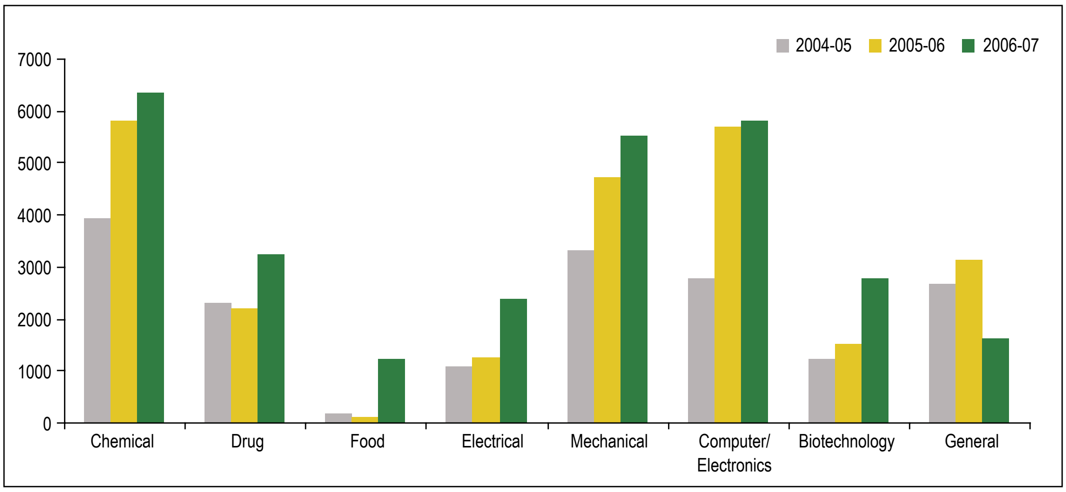
Source: Annual Report of the Office of the Controller General of Patents, Designs, Trademarks, Geographical Indications, Intellectual Property Training Institute, and Patent Information System, 2006-07

Figure 53: Applications filed by Indians and Foreigners



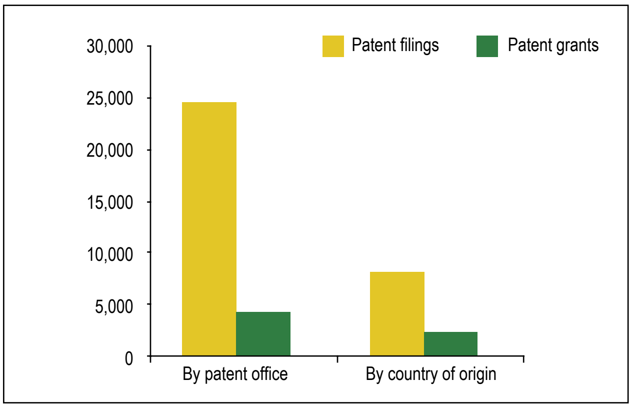
Source: Annual Report of the Office of the Controller General of Patents, Designs, Trademarks, Geographical Indications, Intellectual Property Training Institute, and Patent Information System, 2006-07

Figure 54: Number of patent applications filed under various fields of inventions



Source: Annual Report of the Office of the Controller General of Patents, Designs, Trademarks, Geographical Indications, Intellectual Property Training Institute, and Patent Information System, 2006-07

Figure 55: India patent figures (2005)



Source: WIPO Statistics Database

the data for the year 2006 (WIPO rankings shown below are based on 2005 figures for India and 2006 figures for the other countries). Yet, when one takes into account patent filings as a proportion of population, GDP and R&D expenditure – a better index for innovation – India fares badly.

Table 21: Patent filings by patent office: Top 20 offices, 2006

		2006
1	United States of America	425966
2	Japan	408674
3	China	210501
4	Republic of Korea	166189
5	European Patent Office	135231
6	Germany	60585
7	Canada	42038
8	Russian Federation	37691
9	Australia	26003
10	United Kingdom	25745
11	India (2005)	24505
12	Brazil	24074
13	France	17249
14	Mexico	15505
15	Hong Kong (SAR), China	13790
16	Singapore	9163
17	Israel	7496
18	New Zealand	7365
19	Thailand	6248
20	Norway	6076

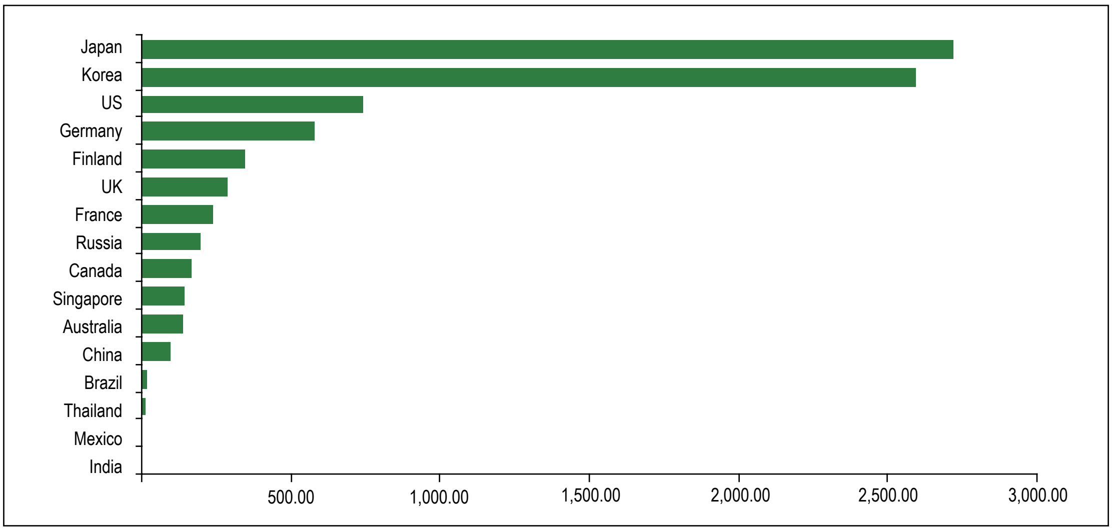
Source: WIPO Statistics Database

Table 22: Patent grants by patent office: Top 20 offices, 2006

		2006
1	United States of America	173770
2	Japan	141399
3	Republic of Korea	120790
4	European Patent Office	62780
5	China	57786
6	Russian Federation	23299
7	Germany	21034
8	Canada	14972
9	France	13788
10	Mexico	9632
11	Australia	9426
12	United Kingdom	7907
13	Singapore	7393
14	Hong Kong (SAR), China	5146
15	India (2005)	4320
16	Ukraine	3705
17	New Zealand	3412
18	Poland	2686
19	Israel	2584
20	Brazil	2465

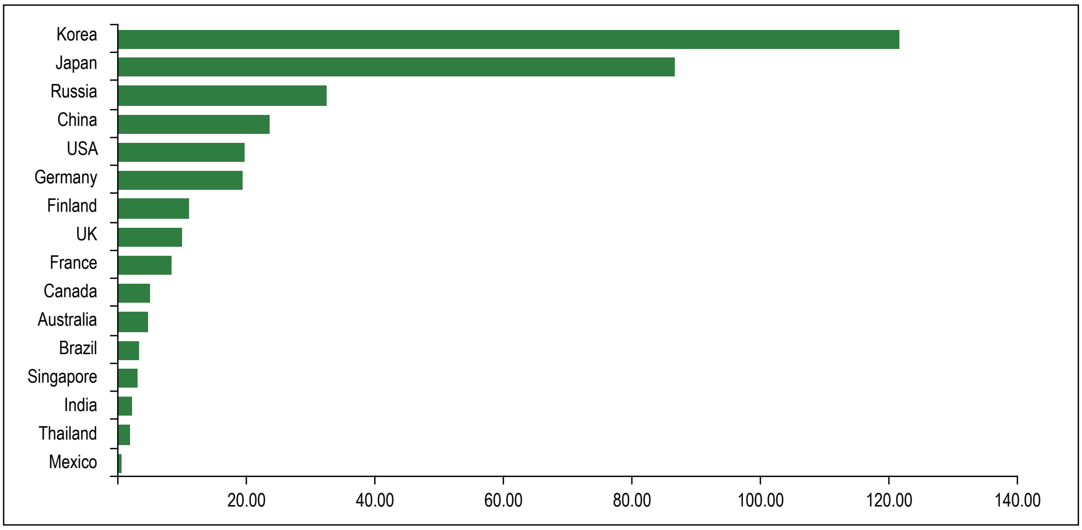
Source: WIPO Statistics Database

Figure 56: Resident patent filings per million population (2006)



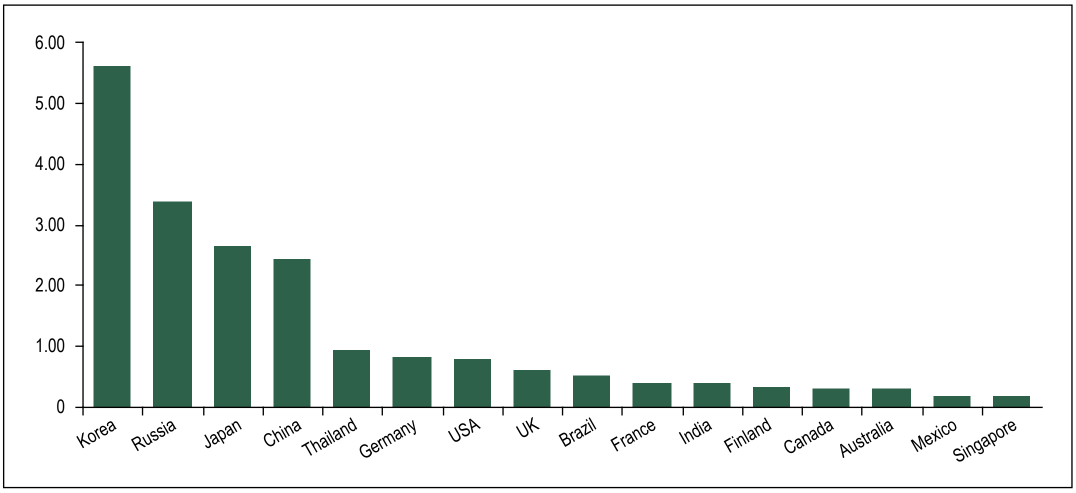
Source: WIPO Statistics Database

Figure 57: Resident patent filings per $Billion GDP (2006)



Source: WIPO Statistics Database

Figure 58: Resident patent filings per $Million R&D expenditures (2006)



Source: WIPO Statistics Database

Entrepreneurship

Introduction

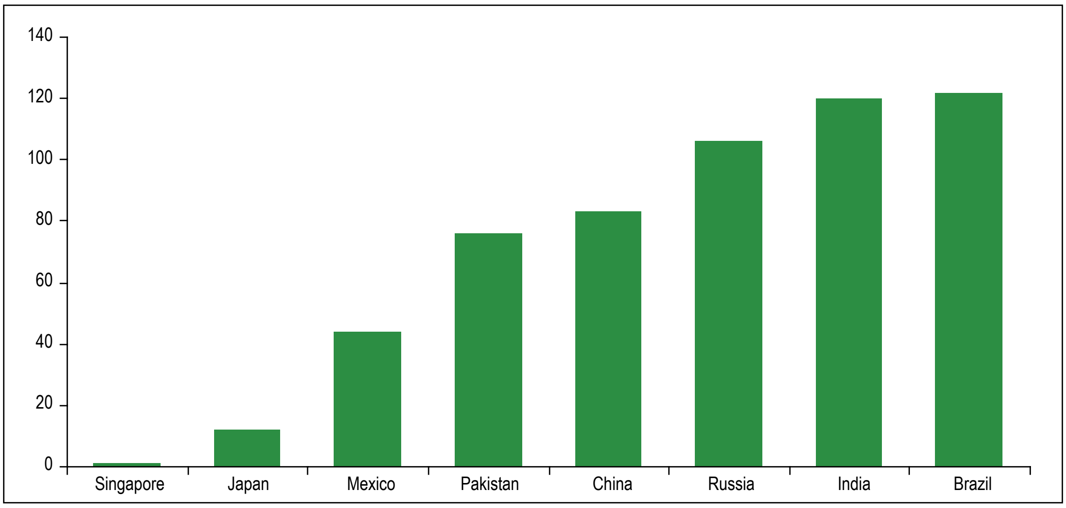
Entrepreneurship is considered to be a significant determinant of economic development. New entrepreneurial activities play a vital part in the process of *creative destruction* that fosters innovation, employment, and growth. While India has traditionally been an entrepreneurial country, it fares poorly in numerous global studies exploring the entrepreneurial and business potential of countries. For instance, in the World Bank Doing Business report (2008) which investigates regulations that enhance business activity, India is ranked 120 out of 178 economies. Similarly, in the World Economic Forum's Global Competitiveness Index (2007), India ranks 48th among 131 countries.

Current Scenario

According to the Global Entrepreneurship Monitor (2007) report, India's High-Growth Expectation Early-Stage Entrepreneurship (HEA) rate is only one-fifth of that of China. Further, among medium and low income countries, while China's nascent and new entrepreneurs appear to be the most growth-oriented, with more than 10 per cent of them anticipating high growth. Early-stage entrepreneurial activity in India is marked by low levels of growth expectation. This is despite the extremely high levels of potential entrepreneurial activity as perceived by the non-entrepreneurially active population in the country (See Figure 60).

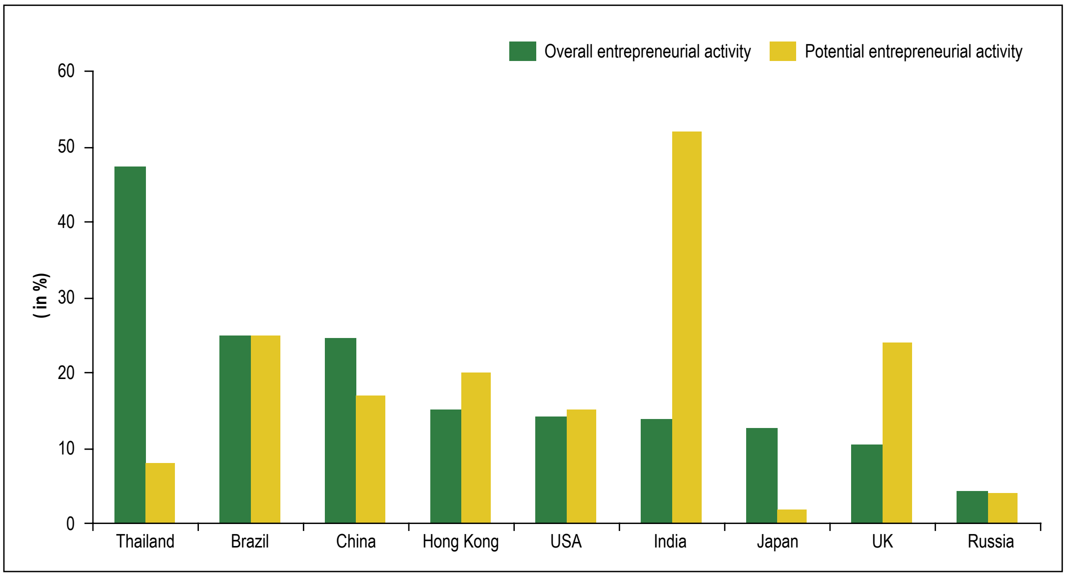
While data on entrepreneurship is hard to come by, the following numbers are telling. According to the NSS 62nd round, in rural India, almost 50 per cent of all workers are self-employed – 57 per cent among males and nearly 62 per cent among females, while the corresponding figures in urban India are 42 for males and 44 for females. The NSSO defines a *self-employed* person as one who has worked in household enterprises as own-account worker; worked in household enterprises as an employer or worked in household enterprises as helper. The essential feature of the self-employed is that they have autonomy (decide how, where and when to produce) and economic independence (in respect of choice of market, scale of operation and finance) for carrying out their operation. According to the 5th Economic Census

Figure 59: Ease of doing business – Global Rank



Source: Doing Business, 2008

Figure 60: Overall and potential entrepreneurial activity



Source: Global Entrepreneurship Monitor, 2007

conducted by the Central Statistical Organisation (CSO), there are 41.83 million establishments in the country engaged in different economic activities other than crop production and plantation. Five states viz. Tamil Nadu (10.60 per cent), Maharashtra (10.10 per cent), West Bengal (10.05 per cent), Uttar Pradesh (9.61 per cent) and Andhra Pradesh (9.56 per cent) together account for about 50 per cent of the total establishments in the country. The same five states also have the combined share of about 50 per cent of total employment.

Issues in the Current Framework

Finance: Access to credit is considered to be one of the key problems faced by entrepreneurs in India. This problem is particularly acute at the start-up stage, where bank finance is hard to obtain. Despite new sources of finance such as venture capital, angel funding and private equity becoming increasingly popular, institutional finance is still not able to meet the current entrepreneurial demands.

Regulation and governance: An entrepreneur has to deal with a host of regulatory and compliance issues. These include registering one's business, obtaining government clearances and licenses, paying taxes and complying with labour regulations. Cumbersome paperwork, long delays and red tapism involved in such transactions create unnecessary burdens for entrepreneurs, constraining their productivity and their ability to do business. As seen in the Doing Business 2008 rankings, India performs poorly in these indicators. A study investigating the effect of regulation on entrepreneurship using the GEM dataset shows India to be having one of the worst regulatory indices. (See Figure 61). Moreover, lack of clarity on information relating to legal and procedural aspects of starting an enterprise, as well as those relating to clearances, licenses and government schemes further aggravates the problem.

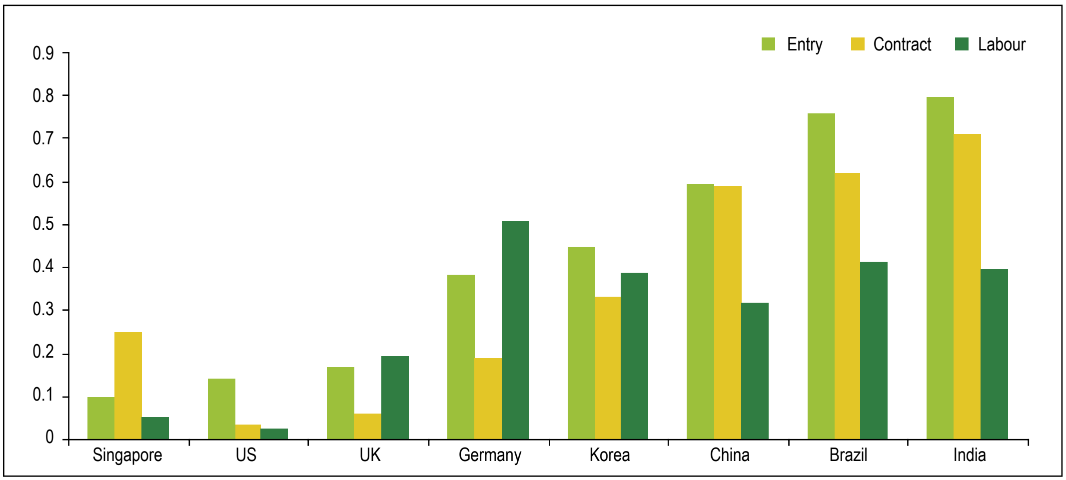
Table 23: India's Ranking in Doing Business 2008

Starting a Business	111
Dealing with Licenses	134
Employing Workers	85
Registering Property	112
Paying Taxes	165
Trading Across Borders	79
Enforcing Contracts	177
Closing a Business	137

Source: Doing Business, World Bank, 2008

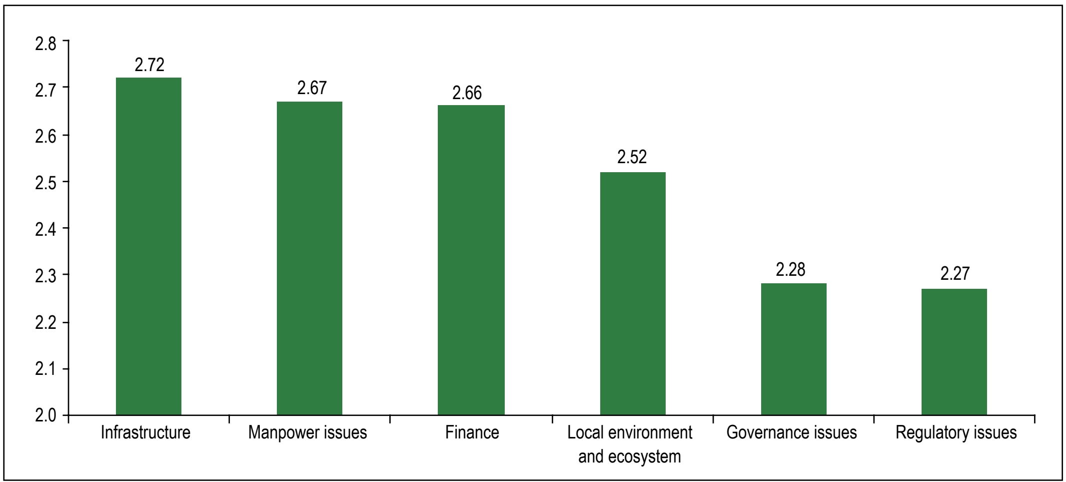
Manpower: Availability of skilled manpower is another crucial issue for entrepreneurs. For example, in a survey of entrepreneurs conducted by KPMG and TiE in 2008, skilled manpower emerged as the second most important factor for fostering entrepreneurial growth. Further parameters reflecting labour market efficiency and flexibility are dismal. In the Global Competitiveness Index, India ranks 102nd in *hiring and firing practices* and 85th in *employing workers* in the Doing Business 2008 report.

Figure 61: Regulatory indices



Source: Explaining International Differences in Entrepreneurship: The Role of Individual Characteristics and Regulatory Constraints, Silvia Ardagna and Annamaria Lusardi, 2008

Figure 62: Relative importance of factors on a scale of 1-3



Source: Entrepreneurial India, KPMG-TiE Report, 2008

Infrastructure: India's physical infrastructure – roads, rail, ports, power, and telecom – is also considered to be a bottleneck to the smooth operation of entrepreneurial activity. The high transport and supply chain costs that poor infrastructure entails can be affect competitiveness to a great extent, particularly for a small and medium enterprise. Enterprises surveyed in the Global Competitiveness Report 2007-08, rated inadequate infrastructure as 'the most problematic factor' for doing business in India.

Education: While the influence of education on entrepreneurship is considered debatable, increasingly education is being seen as part of the larger ecosystem that impacts entrepreneurship and entrepreneurial motivations. Greater practical exposure, critical analysis, entrepreneurship curriculum, incubation and mentoring, industry-research linkages can help in fostering entrepreneurship.

Agriculture

Introduction

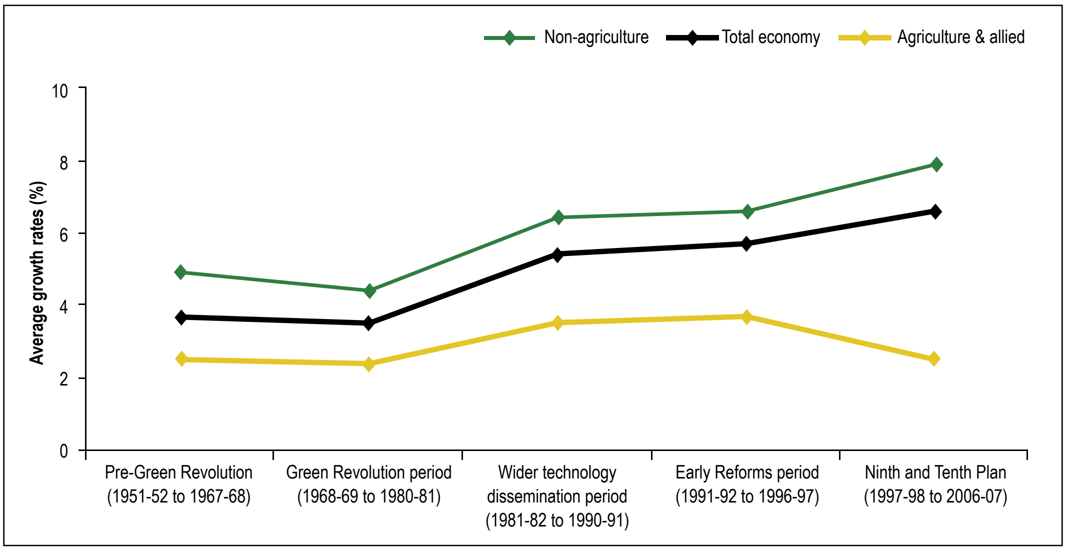
Agriculture is the principal means of livelihood for over 60 per cent of India's population. Despite a steady decline of its share in the GDP (from 36.4 per cent in 1982-83 to 18.5 per cent in 2006-07), it remains the largest economic sector in India. Low and volatile growth rates plaguing agriculture are symptomatic of agrarian crises in several parts of the Indian countryside. Public investment in agriculture has declined and this sector has also not been able to attract private investment because of lower/unattractive returns. A well thought-out strategy for promoting agricultural growth is essential for both alleviating poverty and achieving food-security at the national level. Generation and application of knowledge – through agricultural research and extension services can play a crucial role in meeting the above objectives.

Current Scenario

Research: The Department of Agricultural Research and Education (DARE) is responsible for addressing agricultural research and education needs in the country. This responsibility is discharged through the Indian Council of Agricultural Research (ICAR), an apex and autonomous organisation for agricultural research and education. The DARE has an extensive network comprising 48 Central Institutes, 5 National Bureau, 12 Project Directorates, 32 National Research Centres and 62 All-India Coordinated Research Projects.

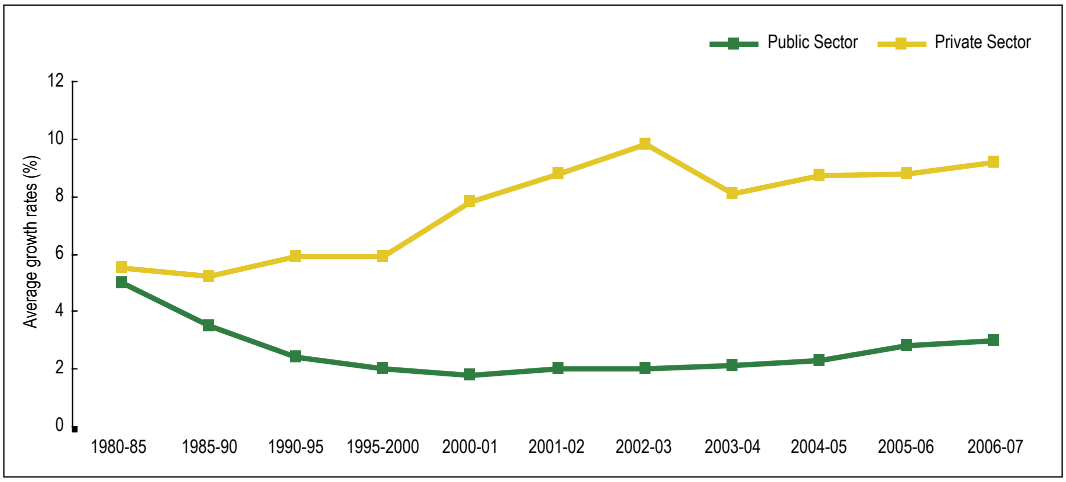
Education: The Indian agricultural education system comprises of 40 State Agricultural Universities (SAUs), four ICAR Institutes (IARI, IVRI, NDRI, CIFE), Allahabad Agricultural Institute, one Central Agricultural University and four Central Universities which have a strong agricultural faculty. There are also a large number of private colleges both affiliated and non-affiliated to SAUs. According to UGC, there are currently 63962 students enrolled in agriculture education in India, accounting for just 0.58 per cent of the total enrolment in higher education. There is a striking regional imbalance in enrolment with Uttar Pradesh accounting for almost 30 per cent of the all-India student enrolment. Further, agricultural studies are not an attractive option anymore

Figure 49: Average GDP growth rates of agriculture and other sectors at 1999-2000 prices



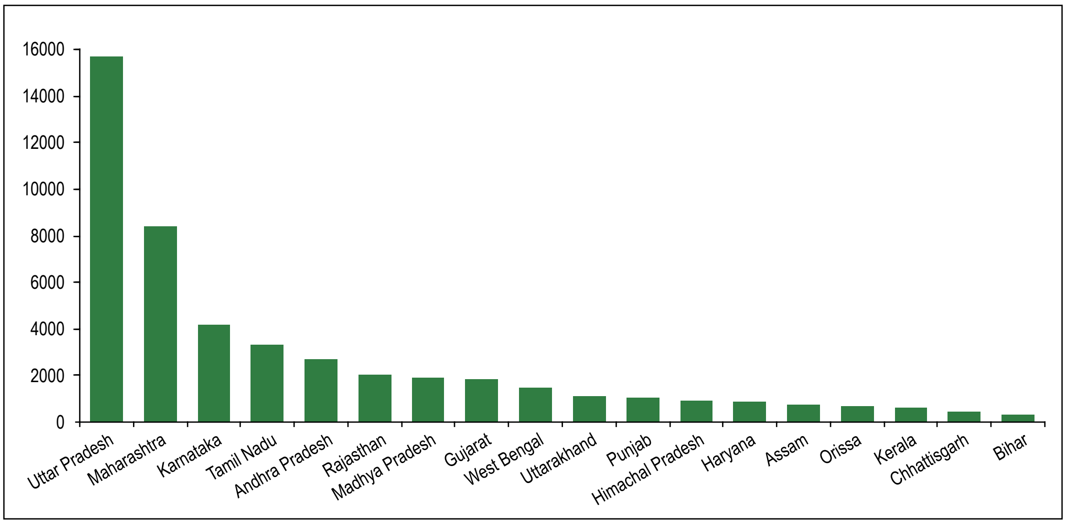
Source: Economic Survey, 2007-08

Figure 50: Investment in agriculture: Gross capital formation in agriculture as a percentage of GDP from agriculture



Source: Eleventh Five Year Plan, Planning Commission

Figure 51: Enrolment in agriculture education (2001)



Source: University Development in India, 1995-96 to 2000-01, UGC

– it is looked upon as an inferior science to be taken up when all else fails.

Extension: The Department of Agriculture and Co-operation (DAC) is the central agency coordinating agricultural extension. In addition, the National Institute of Agricultural Marketing (NIAM) and the National Institute of Agricultural Extension Management (MANAGE) are autonomous bodies established for providing the government further assistance, especially in facilitating the acquisition of managerial and technical skills by personnel involved in the agricultural economy.

Various structures, projects and initiatives have been put in place in order to promote agriculture extension in the country. These include Agricultural Technology Management Agency (ATMA), Krishi Vigyan Kendras (KVKs), Agri-clinic and agri-business centres, Kisan Call Centre Scheme etc. ATMAs have been set up in various districts to decentralise, integrate and coordinate R&D activities, using modern information and communication technology to improve linkages between the various extension agencies. KVKs have been initiated by ICAR to identify the technological gaps, critical needs and requirements of the farmers, and impart skill through various programs. In addition to the demonstration of latest technological development, assessment and refinement at farmers' fields, the KVKs also provide farm information services through literature, exhibitions, field days, farmers tours, crop seminars, kisan melas, radio and television programs, correspondence services, telephone consultancy and helpline services etc. So far over 554 KVKs (as on August 2007) have been established.

Table 19: Global extension practices

Country	Extension Practices
United States of America, Canada, Australia, Denmark	Strong extension services – first public, and now public and/or private. None of these very developed countries has ever considered the discipline of extension as inferior to other agricultural disciplines at the time of resource allocation. Several developed countries have fully or partially privatised their agricultural extension services in a variety of ways.
Costa Rica	The government provides farmers with extension vouchers which can be used for getting extension advice from private specialists.
England	The public extension service has evolved over time into a private consulting practice. The positive result is enhanced efficiency of staff, and the negative effect is the deprivation of small farmers of extension services as the result of their inability or unwillingness to pay.
Holland	About 60 per cent of the extension budget comes from farmers, while the remaining 40 per cent is provided by the government. The benefits include increased efficiency, improved quality, client-orientation, job satisfaction for staff, and expanded marketing opportunities for farmers.
Albania	Private sector entrepreneurial initiatives to create a long-term relationship with farmers have proved to be successful.
Uganda	Privatisation of extension through the creation of a pool of private extension specialists out of its existing public extension service. Registered farmers' associations could call upon this pool through bidding for providing services related to selected enterprises, and pay for the services from the funds given to them by the donors through decentralised government units.
Israel	The government is still responsible for providing extension advice, but encourages privatisation through the standing practice of growers to contribute portion of their income to research and development including extension, public and private partnership in financing and operating units within the extension service, payment for services by commodity production and marketing boards beyond a basic extension package, the provision of more intensive extension activities at the request of needy growers, special agreements with commodity farmers' organisations, extension staff working on their day off in exchange for direct payment from farmers, provision of equipment like mobile phones to extension advisers by growers associations, and direct payment by farmers for participation in training activities.
Indonesia	Some projects have not only encouraged NGOs and the private sector, but also agricultural research institutes, agricultural universities and farmers' associations, to participate in the delivery of extension services. Indonesia has successfully established new institutions called Agricultural Technology Assessment Institutes at provincial level, bringing together farmers, researchers and extension specialists.
Lao People's Democratic Republic, Vietnam and Mali	Experimenting with *tele-centres*, which have already exhibited their benefits in several Western European countries. Virtual linkages are being established for bringing research and extension together, and one example is the VERCON (virtual extension, research and communication network) tool, which FAO has introduced in Egypt and Bhutan. Under an FAO project in the Philippines, the Internet and interactive e-mail facilities have been established at municipality level for supporting decentralised extension staff. *Expert systems* are also being developed to compensate, to some extent, for the too-rare visits of subject-matter specialists to farmers' fields. Over 30 per cent of extension staff in Estonia use the Internet. One can find programs like "virtual gardens" and "virtual farms" on the Internet.

Source: 'Modernising National Agricultural Extension Systems, A Practical Guide for Policy-Makers of Developing Countries', FAO, 2005.

Issues within the research and extension framework

Funding: The current allocation to agricultural R&D, which stands at is 0.7 per cent of agriculture GDP, is grossly inadequate. This funds crunch is the main factor behind the disintegration of public systems of agricultural R&D in several places. Today almost in all SAUs about 80-85 per cent of the budget goes towards salary and other establishment costs. The ICAR share also has dwindled and varied from 33 per cent in the Fifth Plan to almost 9 per cent in the Eighth Plan. In all SAUs, 25 to 30 per cent posts are not filled on account of squeeze in budget and this has seriously impacted quality of instruction. Allocations to this sector must be significantly increased both at the Centre (to at least 1 per cent of GDP) and in states.

Infrastructure and human resources: The financial crunch coupled with bureaucratic rigidities has caused colossal gaps both in basic infrastructure and human resources. Lack of water, power, basic equipment like cell phones and vans, vacancies in the scientific posts in agricultural universities and understaffing of extension providing bodies by underpaid workers are just some of the problems plaguing public research and extension units.

Service providers outside the public sector: The Farmers Commission Report testified that in the 40 per cent of farmer households at an all-India level who *did* access modern technology, "other progressive farmers" emerged as the most popular source (16.7 per cent); followed by "input dealers" (13.1 per cent) and "radio" (13 per cent). Private R&D institutes and demand-driven extension service providers have entered the agricultural economy in a big way. As R&D providers by proxy, they may well be motivated by vested interests and thus pose a real threat to the farmer who has no other option. Alternatively, service providers in the private sector may fulfill an important function efficiently, in the absence of a more reliable mechanism.

Research-Extension linkages: There is often disconnect between the research done by agricultural scientists and the on-farm practices of farmers. (See Table 20) The structure of the present public extension system is linear and compartmentalised, thus propagating a top-down approach that does not encourage interaction and co-operation amongst the several actors. Most importantly, it does not incorporate a mechanism for feedback. Therefore, extension workers continue to disseminate technology that may not only be irrelevant, but also harmful for the farming community.

Information and Communication Technology (ICT): The availability and convergence of ICTs – computers, digital networks, telecommunication etc. – has been significant in the dissemination of knowledge and information to the rural population in recent years. The village knowledge centres established by the MS Swaminathan Research Foundation (MSSRF) in Pondicherry, and the village internet kiosks established by ITC under the "e-chaupal" program are examples of highly successful ICT deployment for research and extension and market access in agriculture.

Agricultural universities: In order to meet the systemic challenges in the R&D arena, the syllabus and curriculum in agricultural universities need to be more flexible and interdisciplinary. Incorporation of social sciences and management techniques, primacy accorded to fieldwork and regular training and refresher courses for extension workers must be added to the curriculum in order to address the disconnect between the lab and the land. Incentives and schemes must be established to attract the best minds to stimulate R&D activities in universities.

Table 20: State-wise performance and potential yield of selected crops

State	Improved practice (I)	Farmer practice (F)	Actual yield 2003-04 (A)	Gap (%)	
				I and F	I and A
Wheat (Yield: Kg/ha - 2002-03 to 2004-05)					
Bihar	3651	2905	1783	25.7	104.8
Madhya Pradesh	3297	2472	1789	33.4	84.3
Uttar Pradesh	4206	3324	2794	26.5	50.5
Rice (irrigated) (Yield: Kg/ha - 2003-04 to 2004-05)					
Uttar Pradesh	7050	5200	2187	35.6	222.4
Bihar	4883	4158	1516	17.4	222.1
Chhattisgarh	3919	3137	1455	24.9	169.4
Sugarcane					
Maharashtra	127440	99520	51297	28.1	148.4
Karnataka	147390	128000	66667	15.1	121.2
Bihar	74420	49440	40990	50.5	81.6

Source: Economic Survey 2007-08

Note: *The data and statistics provided in the baseline section, unless stated otherwise, have been taken from Ministry of Human Resource Development (MHRD), Planning Commission, University Grants Commission (UGC) and District Information System for Education (DISE).*