Chapter 5

Strengthening Skills and Education for Innovation

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More than half of India's population—over 500 million people—are younger than 25. By 2050 India is expected to overtake China as the world's most populous nation, and over the next five years will be responsible for nearly a quarter of the increase in the world's working-age population. Already India has almost a third of the available labor supply in low-cost countries (NASSCOM and McKinsey 2005). These figures, pointing to India's "demographic dividend," represent an enormous competitive advantage for India in its emergence as an innovation economy, and as a potential world-class supplier of skills to the world. However, the widespread perception that India has unlimited employable human resources has changed. India has a growing shortage of skilled workers—caused largely by workforce development and education systems that do not respond adequately to the economy's needs.

To contribute effectively to the innovation economy and capitalize on the growing opportunities of globalization, India's young workforce must develop skills that are more market-driven. Given expanding trade and globalization, India's workforce must have skills that are aligned with its transforming economy and can support the country's continued economic growth. India's ongoing but incomplete transformation from an agriculture- to a manufacturing- and services-based economy requires training a workforce with distinct skills for a market that increasingly rewards problem solving, communication skills, teamwork, and self-learning. Skills are needed not only by high-skill sectors but also by labor-intensive industries, which require technological developments to be absorbed by a workforce adept in basic technological literacy and key competencies.

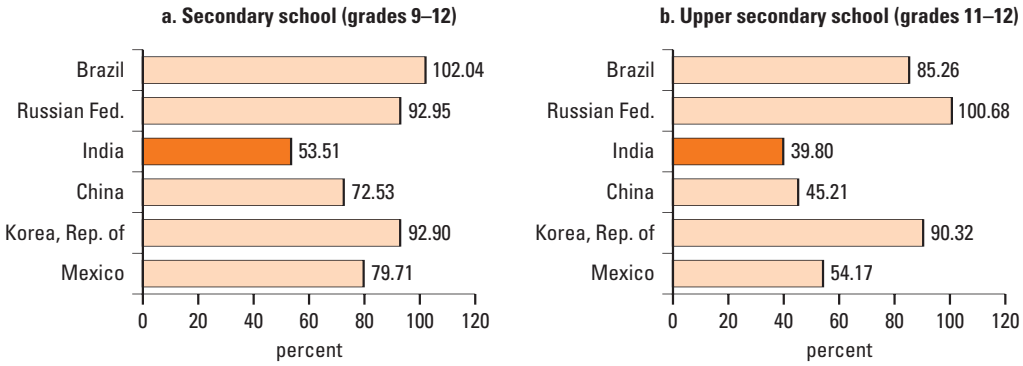
Improving Basic Skills in the Formal and Informal Sectors

Although enrollment in primary schools has increased to 93 percent (Pratham 2007),[1] the quality of primary education continues to be uneven. Since the announcement of the National Policy on Education in 1986, several initiatives have been launched to prepare Indians for the demands of the 21st century. The Sarva Shiksha Abhiyan (Education for All) Movement, for instance, is a government program that seeks to universalize elementary education (grades 1–8) of sufficient quality by 2010. Under this initiative, more than 100,000 new elementary schools have been opened and approximately 500,000 additional teachers have been appointed as of December 2005 (Ministry of Human Resource Development 2006). However, reading, writing, and arithmetic skills remain low among the literate population: 44 percent of students in grades 2–5 in government schools cannot read short paragraphs with short sentences, and 28 percent of students in grade 5 cannot do two-digit subtraction problems (Pratham 2006).[2]

The quality of education at state-run schools needs to be improved. A Harvard University study found that there were instances of absenteeism and no teaching among primary school teachers: one in four teachers was absent and, of those present, half were not teaching (Kremer and others 2006). Only 40 percent of primary school teachers have college degrees and 30 percent have not completed higher secondary school. Some 72 percent of schools did not have electricity in 2005 (Planning Commission 2006). High student drop-out rates, given such conditions, are not surprising. The average drop-out rate in primary schools was approximately 31 percent in 2003–04 (Planning Commission 2006). Between 1990 and 2002, the average years of education among adult Indians increased only a little—from three years to almost five years—much lower than in East Asian, Latin American, and Organisation for Economic Co-operation and Development countries (Dar 2006: 7). Fewer than 60 percent of children who were born in 1997 and attended grade 1 reached grade 5 (Wu 2006). Regional disparities in education also contribute to India's uneven economic growth—literacy and enrollment rates vary across India, with southern and western states generally faring better than states such as Bihar and others in the north.

Gross enrollment rate[3] in secondary schools and the quality of secondary education remain bottlenecks. India continues to have an unbalanced pattern of enrollment growth, with enrollment in secondary education growing insufficiently relative to tertiary education. The gross enrollment rate in upper secondary education (grades 11–12) remains low, at 40 percent (see figure 5.1), despite studies showing the high returns to secondary education, especially for women. Between the early 1990s and 2004, returns to upper secondary school in India rose from 11 to 16 percent and returns to tertiary education from 12 to 19 percent.[4] The relatively small pool of secondary school graduates creates a bottleneck, impeding the supply of students for tertiary education. Secondary education in India is often of low quality, characterized by rote learning targeted to examinations and outdated curricula that preclude innovative methods of teaching. Although one of the comparative advantages most

Figure 5.1 Gross Enrollment Rates, 2004



Source: World Bank EdStats.

Note: Numbers for Brazil are from 2003 and for Korea from 2005.

commonly mentioned when referring to the Indian workforce is its knowledge of English, most of the population does not gain this skill through the secondary school system. Many secondary schools still rely on an outdated grammar-based approach to teaching English that does not prepare students to communicate effectively in the language. Despite science and mathematics being compulsory for all secondary school students, their proficiency in these subjects is also debatable. Many ninth graders tested in two states using mathematics questions from an international survey had problems with basic arithmetic skills.[5] Low public funding for secondary education (1.18 percent of GDP in 2003–04[6]) and chronic teacher absenteeism in public schools are also part of the problem. Private schools account for almost 60 percent of the total number of secondary schools but cater to only 25 percent of secondary school students—implying that underfinanced public schools are facing the pressure of absorbing 75 percent of all secondary school students (Planning Commission 2006).

Widespread illiteracy hampers the productivity of the informal sector, despite many programs that serve this sector.[7] India is home to more than a third of the world's illiterate population (UNESCO 2004), many of whom are part of the informal sector labor force. Currently literacy programs are active in almost all 600 districts in India (Planning Commission 2006). Programs to combat illiteracy, such as through the Jan Shikshan Sansthan (Institute of People's Education), have helped to reduce it: in 2001–02 almost 1.5 million people received literacy training. India's National Literacy Mission,[8] established in 1988, is aiming for 75 percent national literacy by 2007. But the official literacy rate is still low at 62 percent.[9] In India this translates to roughly 400 million illiterate people. Some even argue that the 62 percent includes people who are functionally illiterate and can only write their names (*Economist* 2006).

The lack of basic skills also limits the capacity of the informal sector, and while several programs catering to this sector exist, few address the issues of the informal sector adequately. Public training institutions do not play a significant role in

addressing the informal sector—only 12 percent of Industrial Training Institute graduates, for instance, are part of the informal sector. However, a host of other programs and institutions are devoted to this sector. For instance, 675 community polytechnic institutes have been set up with a focus on the informal sector, training about 450,000 people in communities through three- to nine-month courses. Other programs include the Jan Shikshan Sansthan and National Institute of Open Schooling, which offer opportunities to the informal sector through vocational courses and basic education programs. Programs for the informal sector are also administered by other players, including the Ministry of Rural Areas and Employment, Ministry of Small Scale Industries, Department of Women and Child Development, and Bharatiya Yuva Shakti Trust.

However, the multidimensional skill set required by the informal sector, encompassing both technical and business management skills, is not adequately provided for by most formal training programs for the sector. Even apprenticeships, the predominant training program for the informal sector, while flexible and self-regulating, are limited in exposing trainees to modern technology and innovative practices. Many workers in the informal sector are also held back by their lack of basic education, which reduces their ability to absorb the information provided by some of these programs. Finally, although 89 percent of Indian workers are employed by the informal sector, the resources devoted to enhancing their skills do not reflect this reality. In 2003–04, for instance, public expenditure on adult education continued to remain low at 0.02 percent of GDP.[10]

The lack of adequate basic skills in the formal and informal sectors directly impacts the potential of the innovation economy. High illiteracy limits the population's capacity to acquire the basic skills needed for an innovation economy and curbs the productivity potential of the informal and lower-skill sectors. Technological literacy and access to information and communication technology (ICT) resources are also important at the foundational level if India is to continue to capitalize on its strength in information technology–related industries. If adequate skills are not imparted at the foundational level, whether through the formal or informal educational systems, there will be fewer qualified workers in labor-intensive industries and a reduction in the availability of skilled workers for the innovation system as a whole. Moreover, low workforce education levels are significantly correlated to low firm productivity—increasing the average education level of a firm's workforce by one year is associated with a 13–16 percent increase in firm productivity.[11]

Recommendations for Strengthening Basic Skills

To improve basic skills in the formal and informal sectors, the government should undertake the following two reforms:

1. *Use innovative approaches to improve the quality of primary and secondary education.* The government should revamp the primary and secondary education systems by modernizing curricula and creating a more flexible, responsive education

system. Efforts should also be made to introduce television campaigns, national competitions, and summer schools to promote project activities and excellence in public secondary schools. ICT literacy must be given greater prominence in the early years of education to sufficiently prepare students for an increasingly ICT-dominated world. To contend with high drop-out rates, programs such as the Mid-Day Meal Scheme, which can increase student attendance in school, must be strengthened. Teachers must be trained adequately and given sufficient incentives so that teacher vacancies decrease and accountability and motivation increase. The quality of education at primary and secondary schools must be regularly monitored by independent testing bodies (Planning Commission 2006). New approaches also must be experimented with to address existing problems.

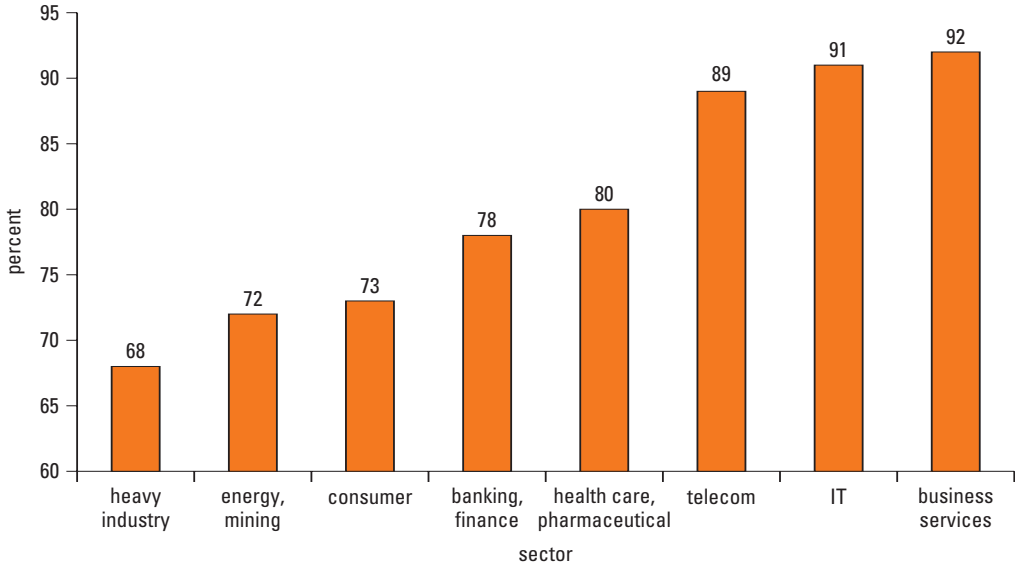
2. *Strengthen basic skills for the informal sector, including functional literacy.* The government should continue to invest in programs that combat illiteracy and help transfer skills to the informal sector by supporting local nongovernmental organizations (NGOs) that provide adequate training to meet the needs of the informal economy. Efforts should include training instructors, developing curricula, and providing financial incentives to encourage external financing of informal-sector training programs. In addition, the government should provide regulatory and financial support for informal education through focused, short-term courses and programs—such as training in information technology (IT) literacy. Innovative ideas should also be considered: for instance, paying workers to attend classes, to compensate for lost wages.[12] Doing so could provide sufficient incentives for workers to attend training programs.

Building a More Skilled Workforce: Enterprise-Based Training and Vocational Education

The shortage of skilled labor in India in the IT and financial sectors is also being experienced by the manufacturing sector. With average annual economic growth of over 8 percent and booming growth in many sectors, it is no surprise that India's education and workforce development system is struggling to respond to rapid growth in the demand for skilled labor. The shortage of skilled labor for the IT industry is well known: although the country produces nearly 400,000 engineers a year, NASSCOM predicts that its IT sector will be short 500,000 professionals by 2010 (NASSCOM and McKinsey 2005).

However, the shortage of skilled workers is not limited to IT: it cuts across sectors and poses a serious hindrance to India's growing economy (figure 5.2). Termed the "Bangalore Bug," the skills scarcity faced by the booming IT and financial services industries is spilling over to other industries, including those that employ less-skilled workers. Recent studies show that the manufacturing sector is losing skilled workers to more knowledge-intensive sectors, and that the increasing affluence of the skilled segments may impede the dynamism of enterprises that employ the unskilled and less well educated (Kocchar and others 2006). Such an

Figure 5.2 Business Executives with Companies Headquartered in India Respond to Future Skills Constraints in Their Sectors



Source: McKinsey 2005.

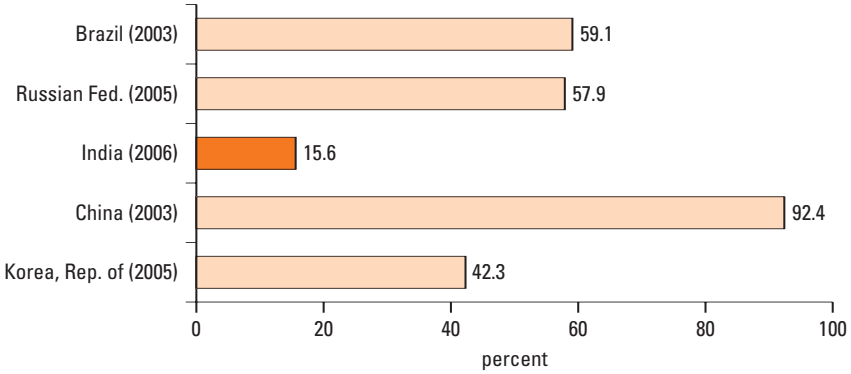
Note: Global business executives numbering 537 answered the question, "Will talent be a significant constraint on the growth of your company during the next 5 years?"

environment leads to increased poaching between industries due to the dearth of talent (Rajan and Subramanian 2006). The advertising industry, for instance, has seen high attrition rates—particularly among senior and middle managers, who are being recruited into sectors such as telecommunications and retail (Srinivasan 2006).

The fastest-growing Indian states and most innovative Indian firms face the most severe shortages of qualified staff. Although the manufacturing enterprises surveyed in the India 2006 Enterprise Survey, on average, did not rank skills and education of available workers among their top five most severe constraints to operations and growth, firms in India's faster-growing regions did. Firms in Maharashtra, Gujarat, and Tamil Nadu cited skills and education as more binding constraints than did those in laggard states.[13] These highly productive states have grown rapidly because of increasing specialization in high skill–based services such as IT, finance, telecommunications, and skill-based manufacturing such as petrochemicals and pharmaceuticals. Thus, it is not surprising that skills and education would be considered important requirements for their firms to maintain a competitive edge. According to the India 2006 Enterprise Survey, firms that innovate consider lack of skilled workers a bigger impediment to growth (17 percent) than those that do not (11 percent).[14]

Indian employers' underinvestment in worker training, relative to their counterparts in other fast-growing economies, places the country at a competitive disadvantage. A firm's capacity to create or absorb knowledge depends on the skills and

Figure 5.3 Manufacturing Firms Offering In-Service Training



Source: World Bank Enterprise Surveys.

training of its workforce. Yet only 16 percent of Indian manufacturing firms provide in-service training to their employees (figure 5.3). This investment in training is low compared with fast-growing East Asian economies such as the Republic of Korea (42 percent) and China (92 percent). The low level of in-service training in India results from several factors (Batra and Stone 2004):

- Most firms not providing training identified the technologies they were using as "mature," and so did not require training or skills upgrading to use new technology.
- Many firms said that training was unaffordable because of limited funding resources, suggesting a weakness in financial markets.
- Many alluded to the high turnover of trained staff, which prevents them from recouping the costs of training employees.
- Many employers pointed out that informal on-the-job training was adequate or that skilled workers were readily available. Both reasons are suggestive of low skill requirements, possibly from the use of mature technologies.

Studies suggest that firms' capacity to innovate and absorb new technology and to benefit from innovation and adoption depends critically on worker skills and training (see Bell and Pavitt 1992). India's underinvestment in in-service training thus severely constrains firms' capacity to innovate.

Empirical analysis suggests that innovative firms invest more in in-service training and that firms that provide formal in-service training are more productive. The share of firms that provide in-service training is significantly correlated with innovation along several dimensions—firm size, industry, whether the firm engages in research and development (R&D), export status, foreign ownership—suggesting the following[15]:

- Larger firms are more likely to provide training than smaller firms, and to rely on in-house training rather than external training institutions, whether public or private.

- Firms in technology-intensive industries—such as automotive components, drugs and pharmaceuticals, and machinery—are more likely to provide in-service training.
- Firms that conduct R&D have a three-times-higher incidence of training than those that do not.
- Export orientation can have a salutary effect on training that produces high-quality products meeting the exacting standards of foreign buyers, and that increases labor productivity to meet competitive pressures (Tan and Batra 1995).
- Firms with foreign equity (possibly because of their embodied foreign technology and know-how) are more likely to provide training than domestic firms.

A key question is whether innovation is possible without a highly skilled and trained workforce. A bivariate probit model was jointly estimated for the decision of whether to innovate and the decision of whether to train. The results suggest that innovating firms tend to be larger, are managed by more educated general managers, employ a more educated workforce, and export; and that firms that train are larger, have some foreign ownership, and export. Most important, the correlation between the two equations is positive and statistically significant, confirming that firms' training and innovation decisions are made jointly (technical appendix table A.5). Finally, the India 2006 Enterprise Survey allows an econometric assessment of the productivity effects of training. Firms that provide in-service training are 23–28 percent more productive than firms that do not.[16]

India's vocational education and training system needs to be better aligned to market needs to meet the preservice training requirements of enterprises. Vocational education and training are distinct streams in India, with vocational education provided as part of the upper secondary school system (grades 11–12) and vocational training provided outside the formal schooling system. However, the relevance and quality of these vocational education training programs are questionable. Only 3 percent of rural youth and 6 percent of urban youth have been vocationally trained (Planning Commission 2006). Fewer than 3 percent of students in grades 11–12 are enrolled in vocational education, and students who enter vocational education programs are believed to be those who performed poorly in 10th grade. Of these, most graduates pursue further education, reinforcing the insignificance of secondary school programs. The irrelevance of these programs to market needs can partly be explained by the lack of private sector involvement in running vocational education and training programs. Although the government seems eager to expand the vocational education system, it is not clear that such an expansion would be useful given the irrelevance of current courses to the labor market and the market's increasing trend to reward general rather than specialized skills (Dar 2006).

Outside the formal schooling system, the main vocational educational program is the Craftsmen Training Scheme, which operates through 1,895 government Industrial Training Institutions that enroll 400,000 students and 3,358 private Industrial Training Centers that train 340,000 students. These institutions are accredited by

government agencies and provide programs lasting from six months to three years. Vocational training is also provided at the tertiary level, varying in duration from one to three years. But the India 2006 Enterprise Survey found that the training offered by external providers of vocational education and training, public and private, does not contribute to higher enterprise productivity. Besides the uncertain quality of the education offered at these institutes, there is not enough information about the effectiveness of vocational training programs due to a lack of evaluation at both the central and state levels. The government also does not have enough information about private providers of vocational education and training, which could mean that private players are being crowded out by the public sector.

In addition, apprenticeship training programs are administered by the Ministry of Human Resource Development and the Directorate General of Employment and Training under the Ministry of Labour and Employment. But only 158,000 apprentices were trained through these programs in 2001, and most are focused on engineering (Dar 2006). Besides, a 2003 study of graduates in apprenticeship training programs found that these training programs were not relevant to the labor market.[17]

Better management and supervision skills are also needed to deal with India's fast-track technological environment, which requires skills channeled toward higher productivity. Good management is required not only in skill-intensive sectors but also in the labor-intensive, unskilled manufacturing sector. Management has a critical role to play in modernizing the labor-intensive sector, especially in less-developed Indian states. Successful technology absorption, for instance, is possible only if managers and supervisors in service firms and industry are willing to introduce new technologies and organizational innovations and have appropriate skills. Good managers should recognize the need for in-service training and for appropriate incentives to motivate employees to generate innovative ideas. The growing modernization of the manufacturing sector will increase the demand for well-educated, trained workers and technicians as well as managers. Although international business leaders rank the quality of Indian management schools very high,[18] a small number of excellent Indian Institutes of Management and other Indian business schools cannot supply sufficient managers—especially for small and medium enterprises (SMEs). And current innovative programs, such as for Masters of Small Business Administration, are insufficient to fill the informal sector's need for entrepreneurship skills.

Recommendations for Building Worker and Manager Skills

There are three important recommendations for building worker and management skills. They are the following:

1. *Strengthen enterprise-based training.* The government should help ensure that the benefits of in-service training are widely recognized by enterprises, while simultaneously providing strong financial incentives—such as matching funds—for firms that invest in training. Existing SME-targeted training programs should be evaluated, and improvements in program design, such as payroll levy training

Box 5.1 Malaysia's Human Resource Development Fund

Malaysia established the Human Resource Development Fund (HRDF) in 1993 to promote enterprise-based training among firms—first in manufacturing and more recently in services. HRDF schemes are administered by a council, with representatives from the private sector and various government agencies, and a secretariat. Eligible employers with 50 or more employees are required to contribute 1 percent of payroll to the fund, making them eligible to claim training funding up to the limit of their levy payments in any given year. The HRDF council sets rates of reimbursement, varying by type of training and size of firm (rates are higher for smaller firms). The HRDF also requires firms to spend a minimum amount on training or lose their levy contributions, creating incentives for firms to train rather than poach skilled workers from other employers.

The HRDF offers different schemes that give employers flexibility in training in-house or using public and private providers, including second-tier public-private intermediaries such as state-level skill development centers. HRDF funding has created a vibrant training market, with public and private providers competing for resources. It addresses information constraints through public information campaigns, subsidized delivery of training need assessments for SMEs, certification of training providers and wide dissemination of their offerings, and electronic billing to keep employers informed of their levy use status. Recognizing the funding constraints of SMEs, the HRDF council enlists certified providers to act as its agents, collecting from users the fees for which firms are responsible and claiming the reimbursable balance from the HRDF, thus reducing up-front cash outlays for SMEs.

Source: Tan 2005.

funds and matching grants (Malaysia Human Resource Development Fund, for instance; box 5.1), should be considered. Financial incentives should be provided to employers that encourage worker training (Dar 2006: viii). And based on results, enterprise-based training should be expanded at the national level.

2. *Improve vocational training.* India's vocational education and training systems have thus far been unsuccessful in preparing graduates to meet market needs, particularly because of a lack of interaction with industry. Aligning these systems with market needs requires restructuring—including private participation—in the management of institutions, curriculum development, and system financing; upgrading infrastructure and instructor capabilities; stronger performance incentives for vocational education and training institutions; and regulatory reform to give training institutions greater autonomy to respond to market skill needs and incentives, to change course offerings, and both charge and retain fees. The abilities of public and private vocational education and training providers should be strengthened to make them more responsive to demand in their offerings. Curricula should be updated to reflect modern technologies and improve flexibility by mapping the supply of and demand for skills and by ensuring that the private sector is involved in curriculum design (Dar 2006).

Incentives should be in place for public-private partnerships to provide vocational education and training. Certification programs that provide a signal of candidate quality would also be helpful. The government, working with the World Bank, has recently launched initiatives to address these issues and improve vocational training.

3. *Strengthen business and management education, including the management of research and commercialization.* Business and management education should be strengthened through public-private partnerships. Innovative management courses should be introduced in engineering and science education through a strong policy push from center (from the All India Council for Technical Education and other quality assurance and accreditation bodies). To strengthen grassroots innovation skills, skills upgrading programs should be matched with technology transfer programs—possibly through small grants for small-scale technology projects involving universities. Stronger incentives are needed to strengthen the entrepreneurial culture at universities and colleges by involving students and professors in real businesses.

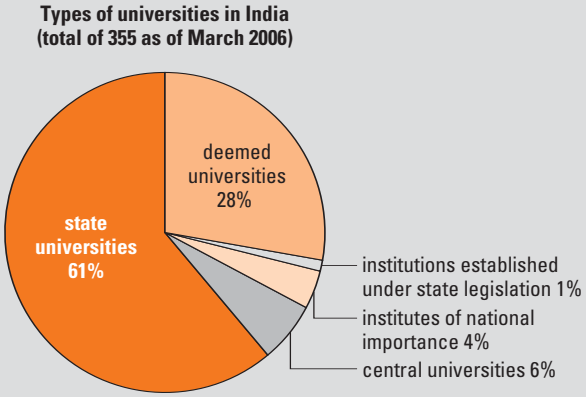
Strengthening Engineer and Researcher Skills: Transferring Market-Relevant Skills in Higher Education

India's demand for highly educated and skilled knowledge workers outstrips the supply. The high demand is fueled partly by India's popularity as an R&D destination for multinational corporations luring away domestic talent, and partly by the blossoming of India's IT and IT-enabled services sectors.[19] The higher education system's ability to contend with the supply constraint will thus play a major role in India's competitiveness as a knowledge economy.

Universities are the cradle for sustained creativity and innovation. Yet despite the global standing of several Indian institutions of higher learning, the higher education system's output is uneven. India's higher education system has two subsystems: excellent institutions, such as the Indian Institutes of Technology (IITs), Management (IIMs), and Science (IISc); and second-tier and other institutions. Excellent institutions, however, are few compared to the multitude of institutions that make up India's large higher education system (box 5.2). Since independence, the number of Indian universities has increased by a factor of 13, the number of colleges by a factor of 24, and enrollment by more than a factor of 10. Selectivity at the top-tier institutions is extremely rigorous. Acceptance rates at IITs are approximately 3 percent. While the seven Indian Institutes of Technology churn out just 3,000 graduates annually, the second tier had 207,000 graduates in 2005 (Puliyenthuruthel 2005). Second-tier institutions, with 2,240 engineering colleges, of which 45 percent are privately managed, are increasingly supporting the growing need for engineers. However, quality training continues to concentrate in "islands of excellence": 80 percent of doctorates in engineering are awarded by 20 leading institutions, while 65 percent of doctorates in sciences come from 30 leading institutions. In addition, rigid curriculum policies and

Box 5.2 India's Higher Education System

- As of March 2006, India had 355 universities and 18,064 colleges.
- An estimated 11 million students were enrolled in the higher education system, taught by approximately half a million faculty.
- Maharashtra had the highest enrollment of students in higher education (1.5 million), followed by Uttar Pradesh (1.4 million).
- Sikkim had the lowest enrollment (less than 5,000).

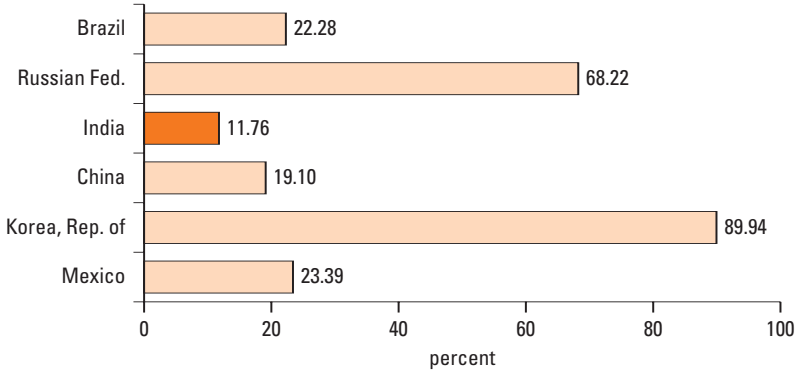


Source: University Grants Commission 2006.

lack of incentives for professors and institutions to modernize curricula lead to limited innovation in the education system. There is also a severe faculty constraint in academic institutions: 20–30 percent of lecturer and professor positions are vacant. Universities have found it hard to retain good faculty, given the high increase in private sector salaries. In an educational system of such uneven quality, competitive entrance examinations have thus replaced university performance as signals of candidate suitability for higher education and jobs (Kapur and Mehta 2004).

The lack of skilled researchers and knowledge creators is manifested in low output of high-quality research. Most research output from Indian institutions, such as patents and publications, has been lackluster. As the scientific advisor to the prime minister recently wrote, research from Indian universities is "hitting an all-time low. They are unable to perform and compete."[20] While China produces 8,000 engineering and science doctorates a year, India generated 6,617 such degrees in 2004–05.[21] Of the 17,898 doctoral degrees awarded by various universities during 2004–05, the faculty of arts led with 7,532 degrees. Enrollment in tertiary education in general is low (12 percent) when compared with other countries (see figure 5.4) and a large number of students are enrolled in disciplines that traditionally have weak links to the job market (figure 5.5).

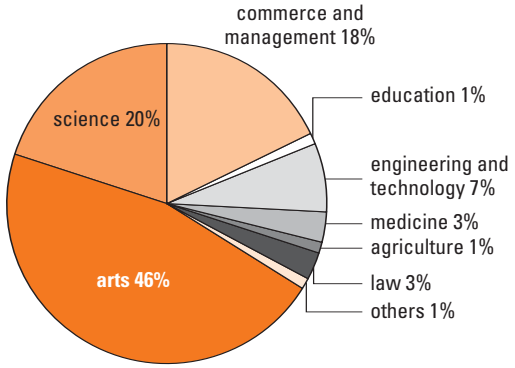
Figure 5.4 Gross Enrollment Ratio, Tertiary Education



Source: World Bank EdStats.

Note: Numbers for Brazil are 2003 and for Korea are 2005.

Figure 5.5 Student Enrollment in Higher Education, 2005–06



Source: University Grants Commission 2006.

India also has not done a good job of retaining its best researchers. Graduates from elite science and technology institutions tend to go abroad for postgraduate study, leaving half of the elite universities with postgraduate programs to accept undergraduates from less-prestigious institutions who have not been trained in highly demanding programs. Most undergraduate colleges do not include research in students' academic requirements, limiting their ability to conduct research at the graduate level. Thus, it is not surprising that only a third of science graduates pursue occupations related to their formal educational qualifications. Although Indians are open to the benefits of science and technology, surveys show that the share of students who want to study pure science at higher levels of education falls from 22 percent in grade 6 to 13 percent in grade 12 (NCAER 2005). The education system is thus not motivating students to pursue careers in science and technology.

Weak links with industry create a mismatch between market needs and worker skills. In absolute numbers, India's output from its higher education system is high—in 2006, 11 million students were enrolled in the higher education system. However,

Box 5.3 Training Offered by the Private Sector in India

Certain players in India's private sector have tried to correct the misalignment in skills provided through the education system and strengthen the skills required for competence in the workforce. These initiatives are probably most pronounced in the IT sector. Players such as Infosys, Tata Consultancy, Wipro, and Satyam Computer Services, which hired a total of 40,000 engineers in 2004, have collaborated with universities to supply course materials and train lecturers on developments in topics most relevant to their business—such as chip design and radio frequency identification. Although these collaborations require investments from the private firms, they pay off almost immediately, because graduates from colleges that partner with these companies require shorter in-house training once hired. For instance, over three years Tata Consultancy reduced its training program from 76 to 52 days as a result of these training collaborations.

Source: Puliyenthuruthel 2005.

McKinsey studies show that only 10–25 percent of general college graduates in India are suitable for employment (Farrell, Kaka, and Sturze 2005). India is likely producing many graduates whose skill sets make them unemployable. One of the main reasons is that links with industry are low in most education institutions, leading to curricula that do not reflect modern technological developments and do not include industrial practices. Universities update training programs without real involvement from advanced industry or the R&D sector. Moreover, since the 1970s university students have not been required to train or do project work in conjunction with industry—leading to student projects being prepared in laboratories that do not reflect existing conditions of technology use. Some initiatives have collaborated with the private sector to correct the labor market mismatch with India's education system. The government's Mission REACH program is creating Centers of Relevance and Excellence in a network of universities to strengthen industry-university links in a diverse set of disciplines. The program's mandate is to produce top-quality graduates with skills directly relevant to industry needs.[22] Similarly, companies like Infosys, Tata Consultancy, and Wipro provide course materials to some institutions and train teachers, enabling them to invest in shorter training times for their employees (box 5.3) (Puliyenthuruthel 2005). However, such initiatives are not representative of the majority of India's higher education institutions.

Rigid centralized control of the education system leads to insufficient capacity for higher education institutions to be innovative and responsive to the needs of students or the labor market. The University Grants Commission is the central body that funds government-recognized universities and colleges and provides accreditation for higher learning through 12 autonomous institutions. Heavy regulation of India's higher education system has limited the ability of institutions to innovate in their curricula, leading to a widely held perception that the system encourages

rote learning rather than creativity or self-learning. Public institutions have not, for instance, been allowed to mobilize private funds (Kapur and Mehta 2004). Universities have low fiscal, managerial, and curriculum autonomy.[23] There also is insufficient industry involvement in governing the education system and institutions.

Low public funding for higher education institutions has constrained their ability to offer quality education. For many years, financing of higher education has been the responsibility of the central and state governments. The central government provides only 25 percent of public financing for higher education; the rest comes from states. Public spending on higher education is low, at approximately 0.7 percent of GDP.[24] Moreover, India provides free education to a relatively large number of students, leading to underfinanced higher education programs. Spending on higher education is estimated to be about 40 percent less than the desired level (Agarwal 2006). This shortage affects the quality of education. The deficit cannot be filled by the government alone—innovative solutions are needed to bring in private funds.

Although the private sector has become active in providing higher education, the quality of private institutions varies, and too much regulation makes private players reluctant to invest enough in education. About half of higher education spending is borne by private sources. Although in many countries private higher education has grown in "soft" areas such as humanities, economics, management, and law, in India the private sector has moved to "hard" professional areas. For example, about 85 percent of undergraduate engineering education is under private management. One of the most dynamic parts of private participation is exam preparation courses (private tutoring). Between 20 and 40 percent of applicants for higher education use private preparation courses.

Private players must surmount significant entry barriers posed by regulatory controls. To grant degrees, private colleges have to be affiliated with state universities, unless they are "deemed" universities. Private colleges are guided by some of the same curriculum restrictions that confine public ones (Kapur and Mehta 2004). In the past, entry barriers were also high for foreign universities, though a November 2006 government agreement to clear foreign direct investment (FDI) in higher education and allow foreign universities to set up campuses in India is a positive initiative. Every year 100,000 Indian students leave to attend foreign universities, at an average annual cost of $4 billion (Lakshman 2006). Allowing foreign universities to set up shop in India could both curb the brain drain and save money for many Indian families. It could also help transform India into a global platform for supplying quality education.

Recommendations for Making Higher Education More Relevant to Market Needs

There are two recommendations for promoting the relevance of higher education to market needs. They are the following:

1. *Increase private participation in higher education.* To address the growing supply constraint of high-quality education institutions, India's higher education system

needs stronger incentives to attract domestic and foreign private participation in higher education and its financing. Private institutions must be able to charge reasonable fees if they are to be encouraged to invest in education. The November 2006 government agreement to allow both FDI in higher education and foreign universities to set up campuses in India is an appropriate step in this direction. Stronger incentives are also needed for private provision and financing of formal and informal education—in particular, encouraging large corporations to establish new universities through public-private partnerships.

2. *Increase fiscal and managerial autonomy of universities and colleges.* An increase in joint training programs with industry—including courses such as small business administration programs for SMEs—would help ensure that university curricula reflect market needs. Joint in-service training programs with university participation should be promoted, possibly through matching grants (to strengthen links with industry). Competitive grant programs for academic innovations and performance-based incentives for professors would also foster a more vibrant academic environment better aligned with the dynamic growth in India's knowledge-intensive sectors. Selected higher education institutions should be upgraded to the highest levels, coupled with the provision of competitive grant programs for academic innovations and the introduction of joint training programs with industry and with top foreign universities and multinational corporations. Systematic analysis of qualification exams should be conducted to review the performance of higher education institutions. In addition, the quality of higher education faculty should be improved by using leading institutions as training centers for other faculty, introducing more performance-based incentives for professors, and expanding grant programs for mobility between professors and industry. Efforts should also be made to move to systemwide quality improvement, with a goal of two or three leading universities in each state. Finally, a national testing system should be established to ensure high, uniform performance standards for higher education graduates.

Notes

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1. This number refers to net primary enrollment rate, or the number of pupils in the theoretical age group for primary education enrolled in primary education as a percentage of the total population in that age group.
2. Figures for private schools are not much better.
3. Gross enrollment rate is defined as the total enrollment in a specific level of education (regardless of age) as a percentage of the official school-age population corresponding to the same level of education in a given school year.
4. Riboud, Savchenko, and Tan (2006) used earnings data from two decades of household surveys in India to estimate the private returns to an additional year of schooling, and how returns have changed for different educational groups.

5. According to the TIMSS (Trends in International Mathematics and Science Study) survey. See Wu (2006).
6. Selected Educational Statistics 2003–04, Ministry of Human Resource Development.
7. This section is drawn from Dar (2006).
8. The program aims to provide functional literacy to nonliterates in the age group 15–35 through its principal strategy, the Total Literacy Campaign.
9. World Bank, EdStats, September 2006, http://devdata.worldbank.org/edstats/.
10. Department of Elementary Education and Literacy: Proposed Scheme-wise Break-up of Annual Plan Allocation for 2005–06.
11. Based on 2006 India Enterprise Survey analysis. See technical appendix table A.6.
12. Conversation with Mr. Jawahar Sircar, Additional Secretary and Deputy Commissioner, Ministry of Small Scale Industries, December 2006.
13. According to the India 2006 Enterprise Survey, the proportion of manufacturing firms indicating that skills and education of workers are a major or severe constraint to business and operation is 26.2 percent for Tamil Nadu, 18.3 percent for Maharashtra, and 17.3 percent for Gujarat, versus 13.6 percent for Bihar, 13.3 percent for Uttar Pradesh, and 10.5 percent for Rajasthan.
14. For this finding, an "innovative" firm is defined as having positive spending on R&D, on royalties or license fees, or having acquired new technology.
15. See technical appendix table A.4.
16. See technical appendix table A.6. This finding is consistent with other cross-sectional studies that have found a strong positive association between in-service training and productivity and wage levels of firms (Batra and Stone 2004; Tan and Batra 1995), and panel studies that have found evidence that training, especially when repeated, leads to higher productivity growth and wages (Tan 2005 for Malaysia; Tan and Lopez-Acevedo 2003 for Mexico).
17. Dar (2006), referring to the study by the Directorate General of Employment and Training.
18. See, for instance, World Economic Forum (2006).
19. According to Global Sourcing Now, the global knowledge process outsourcing industry is expected to reach $17 billion by 2010, of which $12 billion would go to India.
20. C. N. R. Rao in a letter to the prime minister, in Seethalakshmi and Seshagiri (2006).
21. University Grants Commission Annual Report, 2005–06.
22. http://www.missionreach.org.
23. C. N. R. Rao in a letter to the prime minister, in Seethalakshmi and Seshagiri (2006).
24. Ministry of Human Resource and Development, Selected Educational Statistics 2003–04.

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