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Abstract

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Keywords

Singapore, national skills development, skill formation, developing countries, national human resource policy, labor

Disciplines

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CHAPTER 7

Adjusting to Globalization Through Skills Development Strategies

Sarosh Kuruvilla

Globalization requires developing countries to improve the quality of their human resources. Improving national skills helps to attract foreign direct investment.[1] Although developing countries account for a steadily increasing share of world manufacturing (partly driven by lower wages and costs), low-cost competitive advantage is transitory. Sooner or later, developing countries need to "upskill" as other lower cost producers emerge. For example, low-cost production in China spurred skills development initiatives in South Korea, Taiwan, Singapore, and other Asian countries. Improving national human resources is also important given the established relationships between investments in human capital and economic growth.[2] Trade theories such as the Hekscher-Ohlin model stress the quality of national human resources as a critical factor in determining comparative advantage.[3]

Although skill development is clearly a crucial policy issue for developing countries, remarkably little is known about what countries can do to increase national skills quickly. The economic literature correctly stresses the importance of investments in education (at all levels), but skills development also takes place outside the formal educational system, particularly in vocational and professional training institutions and within corporations. Experts, such as A. Singh and A. Zammit, suggest that improving national skills requires a concerted national effort involving multiple institutions, policies, and private-public sector collaborations.[4]

The aim of this chapter is to describe and analyze the efforts at skills development in Singapore and in India's booming outsourcing sector. Singapore is an important case because it started its skills development efforts in the early 1980s at a time when outsourcing of manufacturing was just beginning, and it has become one of the best-known examples of a nation that has successfully and continuously upskilled its workforce over the past twenty-five years.[5] India, on the other hand, is just beginning to

focus on skills development, stimulated by the growth in outsourcing of high-end services such as software development and business process outsourcing (BPO) of financial and medical research and low-end services such as call centers.

This chapter examines the factors that give rise to a national focus on skills development in both countries. It briefly describes the skills development system in Singapore and the initial progress and potential in India's outsourcing sector. The goal is not so much to describe skills development institutions as it is to use a framework employing concepts of high-skills equilibrium and high-skills ecosystems to assess the capacity of countries to improve skills quickly, as well as the policy options for governments seeking to develop their workforces.[6]

The Imperative for Skills Development: Singapore and India

Singapore's programs for skills development began in the late 1970s with the emergence of lower cost producers, especially in the electronics sector in Malaysia and the Philippines. Until then Singapore, like South Korea and Taiwan, had adopted an export-oriented industrialization strategy primarily based on comparative advantages in low-cost labor.[7] Threatened with lower cost competition, Singapore resolved to attract higher value-added investment by mandating (through the tripartite National Wages Council) double digit wage increases for three years, successfully driving out low-cost investors. Since then Singapore has gradually evolved a highly effective and interlinked system that continually improves skills development.

India, on the other hand, has always had a skills surplus for its development needs. With an export-substitution industrialization policy and excellent education institutions, India did not face serious manpower shortages. In fact, given the lack of opportunity within India, many Indians left for the United States in search of advanced degrees and better economic opportunities. As a result, the prevailing wisdom was that India's problem was not a lack of higher level skills development institutions, but a shortage of primary education. However, the explosive growth of software outsourcing in the early 1990s and business process outsourcing during the early 2000s turned this argument on its head.

The data collected by the government on the outsourcing industry is classified into two categories: IT (software services) and ITES-BPO (IT enabled services and business process outsourcing). Although the industry has changed dramatically since 2000 and the distinctions between these two categories have blurred considerably, Tables 7.1 and 7.2 provide some evidence of the significance of the industry in terms of size, contribution to GDP, and exports.

Table 7.1 Indian Outsourcing Market (defined as software services and business process outsourcing), 1997–2003

	Share of GDP (%)			Size (US$ billions)		
Year	Total	Software Services	BPO	Total	Software Services	BPO
1996–1997		0.3			1.859	
1997–1998	1.22	0.72	0.5	5.02	2.936	
1998–1999	1.45	0.97	0.48	6.01	4.011	
1999–2000	1.87	1.24	0.63	8.36	5.539	0.565
2000–2001	2.71	1.81	0.9	12.41	8.298	0.93
2001–2002	2.87	2.07	0.8	13.71	9.958	1.455
2002–2003	3.09	2.38	0.71	15.83	12.314	2.5
2003–2004	3.82	2.64	1.18	19.62	15.574	3.6

Source: Data obtained from National Association of Software and Service Companies (NASSCOM), New Delhi, India, available at www.nasscom.in.

Table 7.2 Indian Outsourcing of Industry Exports, 1996–2004

Year	India Export Earnings (%)	Size (US$ billions)
1996–1997	3.2	1.1
1997–1998	4.9	1.759
1998–1999	7.6	2.6
1999–2000	10.6	3.962
2000–2001	13.8	6.217
2001–2002	17	7.647
2002–2003	20.3	9.545
2003–2004	22.3	12.3

Source: NASSCOM, available at www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=1102.

As these tables indicate, the size of the combined outsourcing industry was $19.6 billion in 2004 and accounted for 21.3 percent of export earnings, while contributing 3.8 percent of GDP. This growth resulted in skill shortages, and estimates suggest that there could be a serious shortfall of about half a million software professionals and employees in the low-end outsourcing sectors by 2009. Further, the growing diversity in the types of outsourced work leads to other shortages as well. In response, for the first time, both state and central governments have turned their attention to the issue of skills enhancement and are working with the private sector to achieve it. The next section describes briefly the steps taken in Singapore and India to develop workforce skills.

Skills Development Systems in Singapore and India

Skills development in Singapore is a "system" because it evolved over the years into a configuration of interrelated policies and institutions all geared toward improving skills in the city-state. In contrast, India's efforts really do not constitute a system because there is little or no interaction among its components. However, by 2005, India was only starting to reexamine its education and skills policies.

Singapore

Studies of skills development in Singapore suggest that five key features characterize the system.[8] The first is the tight coupling between economic development strategies and skills development policies. The government was able to mold its national human resource policy to provide the skills necessary for each phase of economic development. During the import-substitution industrialization period (1959–1965), the national focus was on improving basic education and developing secondary vocational institutions and polytechnics that not only provided the science, math, and technical education required for economic development, but also met short-term needs for trained technicians.

With the adoption of an export-oriented industrialization phase (based on cheap labor and foreign investment) from 1966 to 1973, attracting foreign investment became the government's main focus. Because foreign investors needed technically trained manpower, the government's response was to increase the number of technical education institutions and to articulate the "skills and technology transfer model" in which foreign investors were given incentives to participate in technical education.

The higher value-added, export-oriented strategy adopted during Phase 3 (1973–1984) required improvements in both general skills (vocational and technical training for occupations such as fitters, electricians, and welders) and specialized skills germane to the industries that were growing as a result of foreign investment. The policy response was threefold: (1) the government established a large "general skills" supplier, the Vocational and Industrial Training Board; (2) the Economic Development Board (EDB) intensified its model of technology transfer for meeting specific skills by inducing foreign companies with subsidies and grants to take the initiative in training; and (3) policymakers reformed the education system, creating a German-like dual channel to funnel high school students into vocational institutions or colleges. The government reformed curricula at the National University of Singapore and created the Nanyang Technological University and two new polytechnics.

From the mid-1990s, economic development policies sought to enhance

creativity among the young and develop entrepreneurial risk-taking behavior. This new focus of economic development moved toward making Singapore a major investment force in the region and responded to industry feedback that although Singapore graduates were analytically sound and could execute well-defined tasks, they were often stymied when problems and instructions were not clear or when they faced situations that demanded innovativeness and creativity. This resulted in revamping the basic education system away from exams to projects that stimulate creativity.

The skills and technology transfer model described earlier is the second key characteristic of the Singapore system. It provides significant incentives for foreign investors to establish training centers in collaboration with the state, while guaranteeing them the right to hire the training center graduates. This ensures that foreign investors do not face skill shortages in a tight labor market by giving them some control over the supply of skilled people and incentives such as land, buildings, tax relief, and, in some cases, preferable market access and licensing. Although the government initiated these arrangements with two firms (Rollei of Germany and Tata of India), it expanded the concept to start joint-country institutions. The logic here was that if foreign governments participated with the Singapore government in establishing technical training institutions, more foreign corporations would be comfortable investing in Singapore and, once they came, they would also be induced to participate in training.[9] This model of cost sharing with foreign investors and the Singapore government (through the EDB) was successful not only at generating the skills needed in the short run, but also in creating centers of training for transferable skills (or, general human capital) by harnessing foreign firms' unique expertise.

The third characteristic of the Singapore system was the creation of the Skills Development Fund in 1984. Legislation requires employers to contribute 1 percent of the gross salary of all employees earning less than S$1,500 per month to the skills development fund and allowed them to recoup 80 percent of their contribution by requesting training grants for skills development. The training grants are structured to provide training for skills in demand. Firms with training plans covering over 50 percent of the workforce can receive larger grants but companies continuing to use low-skilled workers in low-cost operations are penalized. By 1996, roughly 33 percent of the workforce was receiving training, and corporations were spending 3.6 percent of their payroll on training.

Attention to long-term skills development through reform of education policy is the fourth characteristic of the Singapore system. The government has continuously improved the education system to meet Singapore's human resource needs. In 1979, it introduced the New Education System to improve the quality of Singapore's primary schools and revamped education policy again in 1990 to increase the creativity in school children by

changing the structure of examinations and adding project-based methods of evaluation, more research and term papers, and other methods to encourage students to "think outside the box."

The final, and perhaps the most important, characteristic of the Singapore system are the lines of communication and structure of interaction that enable the system to work efficiently.[10] The EDB under the Ministry of Trade and Industry (MTI) became the architect of the technology transfer model. The National Manpower Council (NMC) facilitates interaction among the MTI, the Ministry of Education, and the Ministry of Manpower—the three government ministries that are involved in upskilling—permitting them to coordinate their work while the NMC retains overall responsibility for matching demand for and supply of skills in the economy. The Productivity and Standards Board (PSB) focuses on productivity improvements in industries and firms and points those firms to appropriate skills training institutions. The PSB thus focuses on workers who are already employed, while other institutions (both training and educational) focus on those about to enter or reenter the workforce. Interaction takes place among these ministries through committees.[11] Frequent job rotation among leaders of these institutions succeeded in creating a unity of purpose for the system. Further, given Singapore's tripartite system—management, labor, and government representatives sit on the boards of most public institutions—also provided a channel to keep the training and skills development programs focused and relevant. The strong coordination of administrative departments, the variety of institutions and policies included in the system, and the feedback loops built into the process suggest a national and coordinated effort to improve workforce skills in Singapore.

India

Skills development in India is not yet a system because there is little connection between policies and institutions and little uniformity of purpose. Basic education in India is the joint responsibility of the central government and the various states, resulting in considerable duplication. Both central and state governments run schools, colleges, and technical institutions. At the highest level, for example, are the six world famous Indian institutes of technology (IIT), which were established by the Ministry of Education. However, most states and the private sector run their own institutes of technology, although not all are of the same quality. And both private and public sectors run colleges, although only the states operate universities. Both central and state governments provide vocational education and a Central Apprenticeship Scheme (modeled on the German system) helps provide trained blue-collar workers for manufacturing. Private institutions also provide a wide range of skills training.

India has few problems with tertiary education although it faces serious deficits in primary and secondary education. The Ministry of Science and Technology was established in 1971 to formulate science and technology policies and implement, identify, and promote "frontline" research throughout the science and technology infrastructure. The ministry, through its subordinate Department of Science and Technology, also provides funding for domestic institutions and research programs. The Department of Scientific and Industrial Research, a technology transfer organization, and the Department of Biotechnology, which runs developmental laboratories, are the ministry's other administrative elements. The integration of science and technology planning with national socioeconomic planning is carried out by the Planning Commission. Scientific advisory committees in individual socioeconomic ministries formulate long-term programs and identify applicable technologies for their particular areas of responsibility.

Seven other institutions are also involved in human resource development. At the national level, government organizations provide hands-on research and development at the ministries of atomic energy and space, the Council of Scientific and Industrial Research (CSIR), which is a component of the Ministry of Science and Technology, and the Indian Council of Agricultural Research. Organizations that support research and development include the departments or ministries of biotechnology, nonconventional energy sources, ocean development, and science and technology. State government research and development agencies are usually involved with agriculture, animal husbandry, irrigation, public health, and the like, and are part of the national infrastructure. The four other major components are the university system, private research organizations, public-sector research organizations, and foundations. Little evaluation has been done of how all of these policies and institutions are coordinated. The total output of graduates from India's 253 universities and 13,150 colleges is roughly 2.5 million a year although no national data are available on how many of these graduates find jobs or on how much vocational training is provided by the central government, state governments, and the private sector.

In the outsourcing sector, skills shortages loom in several areas. Tables 7.3 and 7.4 provide a general picture of skills shortages based on the projected annual growth rates of the outsourcing industry. These are data based on my estimates as well as estimates from NASSCOM (National Association of Software and Service Companies), the industry association.

These tables suggest that shortfalls plague both the high and low ends of the outsourcing industry. In the software export industry, the average intake per year is about 70,000 software engineers and professionals. While the output from engineering schools has increased steadily and numbered about 400,000 in 2004, less than a third of them had information technology

Table 7.3 Macro HR Issues: Human Resources Supply for Software Services Industry in India

IT service exports	460,000
Domestic IT services	520,000
Products and technology services	140,000
Total demand (2009)	1,120,000
Current pool	360,000
Estimated supply based on current trends	525,000
Total supply (2009)	885,000
Shortfall	235,000

Sources: Author's estimates are based on field research and NASSCOM, available at www.nasscom.in/Nasscom.

Table 7.4 Macro HR Issues: Human Resources Supply for BPO Industry

Total output of graduates from 253 universities and 13,150 colleges (millions)	2.46
Current employment in BPO industry, 2004	250,000
Expected annual intake over next 3 years given 55k, 2004	75,000+
Some English-speaking ability (30 percent)	738,000
Effective supply of English-speaking graduates available to work	150,000
Estimated that about 30 percent of graduates will work in this industry	50,000
Current average turnover in BPO space	40 percent
Estimated requirement by the year 2009 at CAGR	1,003,000
Shortfall by 2009	250,000

Sources: Author's estimates based on field research and NASSCOM, available at www.nasscom.in/Nasscom.

qualifications to work in this industry. By 2005, shortages of trained personnel appeared in data warehousing and in several IT-related fields, including IT security and programmers in JAVA, SAP, ERP, J2EE, and C++. On the quality front as well, the number of engineering PhDs, who are critical to the development of the software industry and to engineering education in general, decreased from 675 in 1987 to 375 in 1995. In the lower end BPO industry, there seems to be a quantity problem given shortages in the supply of English-speaking people who can work in call centers, and the industry is complaining about the weak educational infrastructure to produce more English speakers.

Assessing Skills Development Systems

How should national skills development systems be assessed? There are no ready-made frameworks or measures for this purpose.

General and Specific Approaches

Generally, it is possible to assess the effectiveness of skills development policies and institutions based on their objectives. Macro data can be useful. Economic growth and foreign direct investment were key variables driving skills reform in Singapore. Among Singapore's agencies, the EDB prefers to look at economic growth and FDI, while the PSB prefers to focus on productivity increases in the economy. Table 7.5, for example, provides such macro data for Singapore, where it is relatively easier to use this data to assess the effectiveness of skills development given our knowledge of the objectives of policies in Singapore. Similar macro data are less useful in India, where there is no system of skills development and which has a much larger and more diversified economy.

Data on skill mismatches may also be useful. Arguably a skills development system is functioning well if there are no shortages or high levels of unemployment. There are always skills mismatches in countries because education systems rarely keep pace with evolving technologies, and it is

Table 7.5 General Macro Indicators in Singapore, Selected Years

Year	GDP Growth Rate	Per Capita GDP at Current Market Prices in Singapore ($)	Growth Rates of Foreign Direct Investment	Change in Labor Productivity	Literacy Rate
1965	6.6	1,567			60.2
1970	13.4	2,798			68.9
1975	4.0	5,941			76.2
1980	9.7	10,394			82.3
1985	−1.6	14,226			
1986	2.3	14,225	10.5		
1987	9.7	15,487	21.2		
1988	11.6	17,819	19.5	5.0	87.7
1989	9.6	19,854	14.7		88.4
1990	9.0	21,812	21.3		89.1
1991	7.1	23,604	9.4		90.3
1992	6.5	24,730	3.84		90.3
1993	12.7	28,105	10.77	9.1	90.8
1994	11.4	31,175	18.86	6.4	91.3
1995	8.0	33,404	12.9	3.3	91.8
1996	7.6	34,928	11.5	1.2	92.2
1997	8.5	36,963	19.2	2.2	92.8
1998	0.1	35,040		−2.3	93.1
1999	5.9	35,958		5.8	
2000	9.9	39,585			

Source: Kuruvilla, Erickson, and Hwang, "An Assessment of the Singapore Skills Development System," 2002.

therefore difficult to determine if the data suggest a serious problem with national human resources or just a time lag issue. In a small economy such as Singapore's, these data are more meaningful, yet still cause problems that can be seen in Table 7.6.

The data in Table 7.6 are not easily interpretable given that Singapore was hit by the Asian financial crisis during the period. This is probably why unemployment figures were lower than vacancy rates in 1996 and 1997, but higher in 1998 and 1999. The problem of retrenched older workers who are not capable of being trained also affects these figures. Similar data are not available in India.

Whether or not a skills development system is functioning well can also be assessed by evaluating components of the system. That is, if each institution is producing more graduates that meet industry needs, and if each skills development policy is successful in changing the behavior of the firms, institutions, and individuals to which it applies, then one could argue that the system is working well. This of course does not say anything about the synergistic efforts of an entire system, but at least it addresses the efficacy of individual policies and institutions. Data on efficacy of different components in Singapore suggest that the skills development funds work well in increasing corporate training. Educational institutions are producing more and relevant skills and vocational training institutions are steadily increasing their output of graduates, all of whom are being placed in the industry.[12] Average levels of productivity growth remain high in Singapore.

Measuring the "quality" of education is also a way of assessing the skills development system. One key quality measure focuses on comparative performance of students. A popular one used in the United States is to compare the performance of US students to international students on standardized tests in specific grades or age groups. The International Math and Science study, for example, measures the performance of thirteen-year-olds in math and science across a number of Western and Asian nations.

Table 7.6 Unemployment and Job Vacancies, 1996–2000

Year	Unemployment Rate	Unemployment Numbers (thousands)	Job Vacancy Rate	Job Vacancies (thousands)
1996	2.0	37.3	4.8	44.2
1997	1.8	34.8	4.4	42.0
1998	3.2	62.7	1.9	18.3
1999	3.5	69.5	2.2	20.0
2000	3.1	65.4	2.8	27.6

Source: Kuruvilla, Erickson, and Hwang, 2002.

Singapore students have consistently ranked at the top in studies of both thirteen-year-olds and eighteen-year-olds. Here again there are no data from India because it has not participated in these comparisons, which are only useful for countries that have universal and relatively standardized education, neither of which India has yet achieved.

Thus, evaluating individual components provides useful data on efficacy, but linking changes in economic growth rates and productivity changes to overall skills and education improvement is often difficult because data are not available or are problematic for drawing causal inferences. In the Singapore case, however, all of the evidence—the performance of individual components, the macro data on growth and foreign investment, data on skills mismatches, and information on productivity improvement—does paint a consistent picture of workforce skills improvement. This is consistent with Singapore's stated goals and the objectives of policies and institutions, indicating a strong association between skills improvement and economic performance. However, India does not have very much information on goals and the quality of its programs. Although rough data on quantity (e.g., graduates of institutions) exist or can be collected, little of the outcomes data can be effectively linked to quantity data. However, the emergence of the outsourcing industry (both high and low end) makes it easier to evaluate skills development in this relatively narrow sector of the Indian economy.

High-Skills Equilibrium Approach

Given the problems with assessments of outcomes noted above, a more useful framework for policymakers in developing countries may be to examine whether their nations have the capacity to generate and improve skills continuously. This approach raises the issue of what are appropriate policies, institutions, and practices and how well they are working, and requires more "systemic" thinking about what is required for success. An approach developed by D. Finegold and D. Soskice focuses on whether or not the institutional conditions for moving into a high-skills equilibrium (HSE) exist.[13]

The basic underlying tenet of this approach is that countries must have the essential institutional prerequisites enabling them to move to HSE. The concepts can be applied more universally without getting bogged down in the measurement of the efficacy of individual components or institutions. Countries can be compared by whether or not the prerequisites exist. If they do, then those nations can be said to have the potential to move toward high-skills equilibrium. Having the institutional prerequisites does not, of course, guarantee movement into HSE; the skills development institutions also must function effectively as they did in Singapore.

Finegold and Soskice's perspective suggests that movement to HSE requires action on behalf of all actors in the system including governments, institutions, firms, and individuals. Individuals, for example, must be willing to invest more in education and training, firms must be constantly motivated to improve employee skills, and governments must reduce skills shortages. Three institutional and market prerequisites are necessary: (1) factors that force organizations to take a long-term outlook (mostly institutions that counter pressures from capital markets to focus on the short term); (2) factors that encourage interfirm cooperation within a competitive environment; and (3) export orientation, or exposure to international competition.

Singapore

Finegold and Soskice contend that competitive capital markets and short-term profit goals prevent firms from making longer-term decisions. Although capital markets in Singapore are competitive and exert the same pressures, three other factors encourage a longer-term view of skills development. First, a tight labor market in Singapore forces employers to take a longer-term perspective in employee retention and training. Singapore has been at full employment levels since the mid-1980s and it must import both skilled and unskilled labor. While such tightness could result in considerable turnover (as, for example, it did in the Silicon Valley of California), real turnover rates in Singapore are low and, indeed, declined during the 1990s (see Table 7.7) due to employers' incentives to retain employees and an institutional and cultural setting that discouraged poaching and job-hopping.

Second, labor union activity also encourages job security, and macro-level tripartite agreements (such as the mechanisms put in place during the Asian financial crisis) limit the ability of firms to layoff and retrench workers freely. In particular, the government plays an important role because its long-term plans are built around a consensus among politicians, civil servants, business, and labor. Thus, long-term planning is not derailed to meet short-term needs. This is one of the benefits of the tripartite structure of Singapore's industrial relations. Third, individuals also invest in more edu-

Table 7.7 Turnover Rates in Singapore, 1988–1999

1988	1993	1994	1995	1996	1997	1998	1999	2000
3.9	3.2	3.1	3.0	2.8	2.7	2.1	2.2	2.5

Source: Kuruvilla, Erickson, and Hwang, 2002.

cation and training largely because there is, in Finegold and Soskice's terms, a well-defined high-status structure of qualifications. Success is measured by qualifications, position, and income and there is a clear return to investment in education. Thus, significant pressures make government, firms, and individuals take a longer-term perspective.

With regard to the second prerequisite—the existence of cooperation in a competitive environment—Finegold and Soskice argue that firms need to cooperate in providing training and skills development. Failure to cooperate has serious consequences, notably the fear that some firms will poach employees from others that invest in training, something that is more likely to happen in tight labor markets. Despite a tight labor market in Singapore, cooperation among firms in providing skills training is largely a result of government initiatives. The EDB's model of technology transfer and skills development brought together firms initially through collaborative training centers organized by the Singaporean and other governments and later through industrywide training centers operated by the government. Through these centers, the private sector provided critical skills training to meet their own needs and the companies providing the training were guaranteed that workers would not, at least in the short run, take their skills elsewhere. The incentives provided to firms to invest in training, and the government's own willingness to fund or build the administrative apparatus for the delivery of skills to the entire industry, are critical to continued cooperation. In short, government-led strong institutional mechanisms allow firms to cooperate and share information on developing skills for their industry. The Precision Engineering Institute in Singapore, which uses the expertise of many firms to train people for the entire engineering industry, is one such example.

Establishing such cooperative links between otherwise competitive firms is only part of the process of achieving high-skills equilibrium (HSE). Firms are generally not in a position to look at occupational needs across sectors as do state manpower planning departments. However, macroinstitutional forums for negotiations between the primary economic actors and government officials (corporatist institutions) enhance the movement toward an HSE. Such corporatist institutions, argue W. Streeck and P. C. Schmitter, are successful at forging a consensus among decisionmakers to shift investment and skills to high-growth sectors and to deal with the pain of firm restructuring.[14] Singapore is ideally placed on this dimension given its corporatist arrangement where labor's links to the ruling political party make it the third partner with government and business. In Singapore, the governing boards of all the major skills development institutions are tripartite in nature, and this corporatist arrangement also devised effective policies for dealing with firm restructuring during the Asian financial crisis.

At the firm level as well, internal cooperation for continual innovation

and change motivate workers to gain new skills. The degree of cooperation internally largely depends on the type of labor-management relations in firms and on the institutional features of the industrial relations system. The government-prescribed enterprise union structure keeps firm-level labor-management relations cooperative as do industrial relations regulations. Legislation limits the subjects of bargaining (job assignments, promotions, transfers, and layoffs are not negotiable), and administrative rules circumscribe the right to strike. Singapore's tripartite structure, in which unions have a voice in national decisionmaking, coupled with a consistently high level of economic growth, keeps industrial relations harmonious. The fact that both labor and employers are unified (97 percent of local unions are affiliated with one federation, the National Trade Union Congress [NTUC]), and that there is only one association of employers (the Singapore National Employers Federation [SNEF]), also enhances tripartism.

The third critical institutional prerequisite is the degree of exposure to international competition, which acts as an impetus to a high-skill strategy for the government, firms, and individuals. Singapore's economic development since 1965 has been based on an export-oriented industrialization strategy. The government responds to constant competitive threats from other Asian economies—initially from South Korea, Taiwan, and Hong Kong, and more recently from Malaysia, Philippines, China, and India—and Singapore-based firms are exposed to international competition, making the city-state a good example of P. Katzenstein's argument that openness of an economy is positively correlated with the development of institutional structures designed to attract high-skill companies.[15]

If having all of the key prerequisites for the development of high-skills equilibrium is a useful way of assessing skills development systems, then Singapore seems to be a good example of a nation that has the capacity to constantly reach new levels of HSE.

India

Unlike in Singapore, where skills development takes place throughout the economy, in India it is currently crucial primarily to the outsourcing industry (software services and business process outsourcing [BPO] industries). Table 7.8 provides an indication of the rapid growth in this industry.

The Indian outsourcing sector performs very differently from Singapore with respect to the institutional prerequisites for high-skills equilibrium. India's capital markets have not yet developed competitively to the point that they force actors to focus on short-term results. Stock ownership is dominated by banks and insurance companies that value steady, long-term returns and the mutual fund industry is relatively new. But a nascent venture capital industry dominated by US firms is growing steadily, bring-

Table 7.8 IT and ITES Industry in India: Market Projections, 2003–2006

Year	Domestic IT Services ($ billions)	Service Exports ($ billions)	ITES (BPO) ($ billions)	Total ($ billions)	Contribution to GDP (percent)	Employment (millions)
2003	2	8	3.6	12	3.09	0.7
2006	5	15	7	27	4.8	1.2
2009	13	28	21	62	7	2.4
2012	29	55	64	148	12.3	5

Source: National Association of Software and Service Companies, available at www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=1102.

ing a shorter-term focus on profits. And firms in the BPO sector, given the newness of the industry, also have to think fairly short term, although high rates of turnover (50–60 percent in call centers in voice-based processes, 20–30 percent in nonvoice-based processes, and 15–20 percent in the higher-end software services industry) are forcing firms to take a longer view of investing in employees to improve retention rates.

The shortage of manpower referred to in Tables 7.3 and 7.4 also pressures governments and firms to take longer-term views. Several state governments have begun to intervene in the industry. The state of Kerala introduced phonetics into the undergraduate curriculum to increase the number of English-speaking graduates. The state of West Bengal is developing special syllabi to prepare graduates for the BPO industry. NASSCOM, the industry association, is helping universities to increase the quality of their syllabi while exhorting the government to create new institutes of information technology with BPO specializations.

On the other hand, there is no institutional basis for job security in this industry. Unlike in Singapore and in India's manufacturing sector, where job security is guaranteed by union activity and backed by industrial relations legislation that makes layoffs and retrenchments a practical impossibility, the BPO sector is not unionized and does not have the benefit of such protective legislation.[16] The newness of the industry and the high salaries paid for entry level call center jobs (Rs. 10,000 per month)—which for college graduates was a salary almost 2.5 times what any other job would pay in 2005—encourage young employees to hop from one call center job to another. Thus, short-term thinking pervades the industry. In the software sector, the shortage of professionals has also encouraged movement among young professionals looking for jobs that will enhance their skills. Salaries in both sectors have grown at the rate of 15 to 20 percent a year.

However, by 2005, the high turnover in the industry was beginning to force firms to take a long-term outlook, particularly to control the training

and recruitment costs that were increasing rapidly due to high turnover. Firms began introducing human resource practices geared to retain employees. They included creating tie-ups with educational institutions that allowed employees to "learn while they earn" at their current jobs, introducing career ladders and growth opportunities within the industry, providing cross-functional training, introducing more incentives tied to tenure, and introducing better general human resource management practices. In sum, both firms and governments began to face pressures to think longer term.

With regard to collaboration in a competitive environment, both software and low-end outsourcing industries in India exhibit a remarkable lack of collaboration. Strong competition for employees and poaching is rampant. Some large firms in the call center industry unsuccessfully attempted to reach a no-poaching agreement. NASSCOM began a series of activities to solve some of the industry's problems and to strengthen collaboration among competing firms, including creating a common certification for BPO training, lobbying the government to open new institutes of technology with BPO specializations, and promoting an industry code on hiring practices, contractual agreements, and salaries that may result in a reduction of turnover by lowering the incentives to job-hop.

Finegold and Soskice note that macroinstitutional forums for negotiations between the primary economic actors and government officials enhance the movement toward HSE. While a corporatist (tripartite) structure accomplishes this in Singapore, India has no such parallel arrangement for industrial relations.[17] However, the centrality of the outsourcing industry to India's exports and, consequently, its economic development, has initiated dialogue among NASSCOM, state and central governments, the central and state ministries of education, and the private sector. By 2005, all of the key actors in skills development began to discuss ways the country can help build the industry. NASSCOM, government, and the private sector began interacting regularly to decide on key issues facing the industry, such as bandwidth costs, bandwidth capacity, standards on data security, new legislation, new educational institutions, new training institutions, and ways of improving the reputation of the industry.

The third critical institutional prerequisite, exposure to international competition, is clearly present in the Indian outsourcing industry. The industry largely caters to the international market, particularly the United States and the United Kingdom, and the industry accounts for 21 percent of India's export revenues. At the low end of the industry—in call centers and elementary software—competition is growing from the Philippines, China, and South Africa, and in the high-end sector from Russia, China, Singapore, Israel, Hungary, the Czech Republic, and Romania. In 2005, India still firmly led the market. Although estimates of market share vary dramatically,

average estimates suggest that India had 60 percent of the business processes outsourced to the third world countries.

Thus, Singapore's system seems to have the institutional prerequisites for attaining a high-skills equilibrium and India's outsourcing industry in the high end and low end does not. Although some movement has taken place among key actors in India toward developing a longer-term outlook, the industry's capacity to move into high-skills equilibrium remains weak.

Long-Term Evolution and Sustainability: High-Skills Ecosystems

Both Singapore and the center of the outsourcing industry in India (Bangalore) have publicly articulated the long-term vision of becoming a high-skills ecosystem like the Silicon Valley in the United States. Although Singapore and the high-end outsourcing industry in India have (or may develop) all of the institutional prerequisites for attaining HSE, the key question is whether they will be able to create the kind of high-skills ecosystem that is found in the Silicon Valley.

The likelihood of achieving these goals can be assessed using D. Finegold's concept of "high skill ecosystems."[18] Both Finegold and M. Kenney have written about the factors that are important in creating self-sustaining high-skills ecosystems such as those found in the Silicon Valley, Cambridge (UK), and the Boston Corridor.[19] Finegold uses a biological analogy to identify factors—a catalyst, fuel or nourishment, a supportive host environment, and a high degree of interdependence for organisms to grow—that create a self-sustaining high-skills ecosystem.

Catalysts

Key stimulants or catalysts in the growth of Silicon Valley were the surge in US Department of Defense funding in the 1940s and 1950s along with the growth of Hewlett Packard and the links between Stanford and IT industry. Research universities played a vital role in the movement toward HSE. In Asia the catalysts have been different. Singapore's universities are not similar to Stanford and Berkeley in terms of either fundamental research accomplishments or in incubating new high-tech start-ups. It is unclear whether Singapore's government-owned educational institutions can become like Stanford or the University of California, since it would require major changes in the way universities are managed and run, particularly in terms of autonomy, academic freedom, research, and teaching. As S. Kuruvilla, C. Erickson, and A. Hwang point out, although government efforts at develop-

ing the infrastructure for the high-technology industry are surely a "muscular" stimulus, universities also need to provide the "brain" stimuli.

Nor is it clear that in India basic research is a driver. By any measure of basic research, India falls short. Government R&D spending is only .084 percent of GDP compared to 1 percent in China and 3 percent in South Korea. In 2001, India had filed only 179 patents, compared to 98,594 by the United States and 266 by China. On the other hand, in 2003, Indian pharmaceutical firms were among the top ten patent filers in the world. However, big firms in India are not research firms, and the culture of entrepreneurship that is the hallmark of universities in Silicon Valley does not yet exist in the IITs in India.

Nourishment

Finegold observes that in the United States universities turn out thousands of well-educated engineers, scientists, and managers, and synergistic relationships between research universities and surrounding firms that hire their graduates become self-sustaining. This steady intake of human capital is coupled with the availability of financial capital. In California, the venture capital industry played a key role in the development of the Silicon Valley. Founders of the first generation of start-up firms sustained the process by sponsoring the second generation. While Singapore does turn out graduates, it is not clear that they turn out enough. The government planned to boost the number of research scientists from 7,900 in 1986 to 13,000 in 2000. By 2004 the government reported nearly 19,000 professionals in research and development.[20] However, it is also clear that much of this demand can only be met through immigration rather than self-generation. Second, Singapore does not have a strong class of venture capitalists.

India provides a steady supply of human capital from the IITs and regional institutes of technology, but many of the high-quality graduates do not work in Indian industry. Instead, they migrate to the United States to attend US graduate schools. On the other hand, the links between industry and academic institutions are growing rapidly in the big metropolitan areas. For example, TCS (India's largest software firm) is closely linked with the computer science department at IIT Kanpur, the M-Tech program at IIT Chennai, and the Mathematical Modeling program at IIT Chennai. IIT Mumbai has research programs financed by Boeing, Honeywell, Microsoft, Sun, and Hitachi. IIT Delhi has an industry-financed applied research center in electronics and another center for biomedical engineering, and the software companies in Bangalore have jointly supported the creation of the Indian Institute of Information Technology to cater to their education and research needs. Thus, industry-academic linkages are growing in India to support this industry, although the IITs do not attract a large number of doctoral candidates and researchers, who prefer to go to the United States instead.

Similarly, the venture capital industry geared toward seed capital funding in India is weak and lacks expertise in judging the potential of start-ups. There is no supportive environment similar to that in the Silicon Valley, where numerous "business incubators" allow technology experts to meet and work with venture capitalists. The venture capital industry is still in its formative stage in India and is growing mainly with the entry of US venture capital firms.

Supportive Environment

A critical ingredient for skills development, according to Finegold, is the existence of a supportive environment, including basic infrastructure, transport and communications, science and technology parks, living conditions that are attractive to knowledge workers (cultural and leisure activities, schools, and proximity to others like themselves), and a regulatory regime that supports innovation and risk-taking (flexible regulations regarding working hours, relative ease in starting a business or taking a business public, and fair and reasonable bankruptcy laws). On this dimension, Singapore's record is mixed. The basic infrastructure is excellent but it is not clear that Singapore does very well in terms of creating a climate that is attractive to knowledge workers or if regulations and social norms encourage risk-taking. A country with a free society and a free press tends to be more attractive to knowledge workers, but Singapore has been known to be rather heavy-handed with those who criticize the government. Further, the encouragement of entrepreneurial abilities requires both supportive legislation (bankruptcy laws) and a society in which failure is tolerated. Again, the extent to which this is true of Singapore is debatable. It is not clear whether a truly innovative environment exists, despite the fact that the government is mandating creativity in schools and college curriculums. Creativity and innovation in business are a function of long-term forces, including freedom of expression, open and free electoral systems, and less intrusive and directive government.

In India, deficiencies in the supportive environment could seriously inhibit the growth of self-sustaining high-skills ecosystems. These deficiencies include weak basic infrastructure, such as roads, urban transportation, water, electricity, and even the availability of bandwidth that is essential to the development of the information technology industry. Already, many firms in Bangalore are threatening to leave the city for other places such as Chennai and Mumbai where basic infrastructure is better. The availability of good schools, of which there is a shortage in India, is critical in attracting software professionals and their families.

Considerable improvement is needed in educational and skills infrastructure in most Indian states and, although that is beginning, it will clearly

take time before the conditions exist for a high-skills ecosystem. On the plus side, India is a democracy, and economic liberalization has brought with it a climate where people are beginning to take more risks and to innovate.

Interdependence Between Actors in the Region

The final element of a high-skills ecosystem is some degree of interdependence between the actors in the region. Finegold alludes to vertical linkages (e.g., Sun Microsystems and its various downstream and upstream business linkages) and horizontal linkages in the Silicon Valley through which firms work together. In Singapore, vertical linkages are strong because a few large state-owned firms (e.g., Temasek) play a significant role in the economy. In India, such vertical linkages are not well developed, although major software firms do create their own BPO arms (Infosys, one of India's best known software firms has its own BPO arm called Progeon, and IBM has recently bought India's largest BPO firm Daksh).

Both Finegold and S. Barley and G. Kunda emphasize the importance of professional individual networks, citing examples of those in the Silicon Valley for programmers and software professionals.[21] In Singapore these professional networks are still weak and in India they have not yet developed, especially in providing an opportunity for people in the industry to keep abreast of technical developments through seminars and other means.

In sum, both India and Singapore need to make policy changes to facilitate their progress toward the Silicon Valley model. India needs stronger physical, financial, and educational infrastructures and Singapore must develop a climate that is more suitable for attracting knowledge workers and investments in basic research. High-skills ecosystems provide a useful framework for thinking about the policies needed for successful skills development.

Conclusion

This chapter briefly describes the successful case of skills development in Singapore. Clearly the focus on upskilling was necessary for Singapore to compete effectively in the global economy. In India, the emerging focus on skills development in the outsourcing industry is both a consequence of globalization as well as a need for sustaining economic development. Evidence indicates that Singapore's efforts have been successful on most dimensions. Although there is no standard or benchmark of best practices in national skills development, Singapore may be the only model among developing nations that meets Singh and Zammit's criteria of a national concerted effort involving both the private and public sectors.[22] If imitation

is an indicator of success, then Singapore's policies are successful, since its neighbor Malaysia has already adopted several aspects of Singapore's system, including skills development funds and centralized human resource planning.

Although some features of its system are unique, much can be learned from Singapore's experience about the important principles that can be used by other developing nations. Of particular importance are three major principles—first, the linkage (administratively and conceptually) between economic development and skills development; second, the EDB's model of technology transfer that takes advantage of the expertise of foreign investors to train local workers; and third, the capacity to induce the private sector to play a key role (in partnership with the government) in the skills training process and in training their own workforces. These three principles are transferable, although the specific institutions that other developing countries design to act on them may be very different, as is seen in India's emerging outsourcing industry.

The concept of high-skills equilibrium can help policymakers judge whether or not their countries possess the right institutional prerequisites and the concept of skills ecosystems offers them a guide to the institutions and linkages that are necessary to develop advanced skills. Unlike in other disciplines, such as macroeconomics, that have models and prescriptions based on theory and developed country experiences, little theory or research is available to guide policymakers in skills improvement. The framework used in this chapter may contribute to that end.

Notes

1. Koike, "Globalization, Competitiveness and Workers' Skills"; Kuruvilla," Globalization and Employment Relations: A Framework for Research."

2. Lucas, "On the Mechanics of Economic Development," pp. 3–42; Romer, "Increasing Returns and Long Run Growth," pp. 1002–1036; Solow, "A Contribution to the Theory of Economic Growth," pp. 65–94; Azariadis and Drazen, "Threshold Externalities in Economic Development," pp. 501–526.

3. Wood, "Skill, Land, and Trade: A Simple Analytic Framework"; Godfrey, "Introduction," pp. 3–11.

4. Singh and Zammit, *The Global Labor Standards Controversy: Critical Issues for Developing Countries.*

5. Kuruvilla, Erickson, and Hwang, "An Assessment of the Singapore Skills Development System: Lessons for Developing Countries," pp. 1461–1476.

6. Finegold, "Creating Self Sustaining High Skill Ecosystems," pp. 60–90; Finegold and Soskice, "The Failure of British Training: Analysis and Prescription," pp. 21–53.

7. Kuruvilla, "Linkages Between Industrialization Strategies and Industrial Relations/Human Resource Policies: Singapore, Malaysia, the Philippines, and India"; Huff, "Patterns in the Economic Development of Singapore."

8. Kuruvilla and Chua, "How Do Nations Increase Workforce Skills? Factors Influencing the Success of the Singapore Skills Development System," pp. 11–49; James, Sung, Green, and Ashton, "The Role of the State in Skill Formation: Evidence from the Republic of Korea, Singapore, and Taiwan," pp. 82–96.

9. See Kuruvilla, Erickson, and Hwang, "An Assessment of the Singapore Skills Development System" for interesting examples and details.

10. See James, Sung, Green, and Ashton, "The Role of the State in Skill Formation."

11. Ibid.

12. Kuruvilla, Erickson, and Hwang, "An Assessment of the Singapore Skills Development System."

13. Finegold and Soskice, "The Failure of British Training."

14. Streeck and Schmitter, *Private Interest Governments: Beyond Market and State.*

15. Katzenstein, *Small States in World Markets: Industrial Policy in Europe.*

16. Frenkel and Kuruvilla, "Logics of Action, Globalization, and Employment Relations Change in China, India, Malaysia, and the Philippines."

17. Finegold and Soskice, "The Failure of British Training."

18. Finegold, "Creating Self-Sustaining High Skill Ecosystems."

19. Kenney, *Understanding Silicon Valley: The Anatomy of an Innovative Region.*

20. Report on Research and Development, available at www.singstat.gov.sg/keystats/annual/yos/research.pdf.

21. Barley and Kunda, *Gurus, Hired Guns and Warm Bodies: Itinerant Experts in a Knowledge Economy.*

22. Singh and Zammit, *The Global Labor Standards Controversy.*