Chapter - II

HUMAN RESOURCE DEVELOPMENT AND
INDIAN SOFTWARE INDUSTRY

“HR should not be defined by, what it does but by what it delivers results that enrich the organization’s value to customers, investors and employees”

– David Ulrich

2.1 INTRODUCTION:

The term ‘IT industry’ is used loosely in common parlance and has different meanings in different contexts. Strictly speaking, ‘IT’ includes hardware production as well as software, but in the Indian context the IT industry is almost entirely devoted to software services, hence the terms ‘software industry’ and ‘IT industry’ are often used interchangeably.

What make software industry today is the Human resources in it. It is one industry where, human brain is the raw material. Right from pin to pen in software industry is human intelligence that flows in the form of a source codes and program logic. Software development as a whole is an expression of programmers logic in the form of a source code and the service are so tangible today that without software the whole world stops. Though we have intelligent systems, MIS, Robos, CASE tools etc, which comes into help in developing customized software solutions but cannot, replace the human resources in any of the fields. It is human resource (software engineers) which has developed this software.
The growth of the software industry in the country since 1985 has been phenomenal and today there are more than 3 billion people working in IT sector. This shows the strength of the human resource engaged in the software development. This growth is due to the growth in the IT business and well backed up by the growth in the production of IT professionals. The major contributors in the development of IT professionals especially the software engineers and related workforce is by the educational Institutions. Especially engineering colleges, polytechnic colleges, Universities etc. have contributed to the growth of the industry by producing software engineers. On the other hand the giant software companies like Infosys, Wipro, IBM etc have significantly contributed to the growth by employing the entire lot of students coming out of the portals of such institutions. Besides that, the human resource management policies and practices of these industries have stabilized the whole demand and supply of IT professionals in the country. It is again these newer human resource practices across the industry that has significantly contributed to the growth of the whole gambit.

2.2 OVERVIEW OF ITS INDUSTRY IN INDIA:

India’s IT service industry presents the case of an internationally competitive, high-tech industry from a developing economy. This industry has both climbed up the value chain and grown in technological sophistication and now spans a broad array of emerging services and technologies. India has competitive advantages over the other developing countries for IT services outsourced from developed nations. This leads to export-oriented growth in this sector, which accounts for about 10% of total export earnings. From its genesis in
simple coding and “body-shopping”, India’s IT exports have gradually climbed up the technological ladder even as they have diversified their geographical and market segments. More recently, opportunities in IT-enabled services and remote processing - from medical transcription to insurance claim processing, from payroll and human resource services to customer interaction services, data digitization and geographical information systems, call centers, digital content and legal databases and online education - have emerged as the most dynamic drivers of the technology-led services industry in India. Offshore back-office operations now encompass not only routing clerical tasks but also highly skilled professional activities drawing on India’s large pool of skilled as well as semiskilled professionals with relative cost advantage.

India has attracted top notch IT companies across the globe to establish their base for technology development. Almost all the major US and European IT firms have set up software development and R&D centers in India, especially in Bangalore. All major IT players found a mature place in India to develop their high quality, innovative, high worth IT products from Indian development centers. Some of the important multinational IT companies that have development centers in India are Microsoft, Oracle, IBM, Texas Instruments, SAP Technologies, Siemens, Intel, Google, Yahoo!, Adobe, etc. On the other hand, many Indian transnational IT service companies emerged in last three decades to offer world class IT products and services across the world. These Indian companies intelligently utilize the positive network and reputational effects of the “brain drain” and the Indian Diaspora (especially in Silicon Valley) for getting businesses from the reputed organizations. These companies negotiate with the global top-notch companies for their IT solutions and support services. These companies
develop high quality solutions and services from Indian development centers for their clients with relatively low cost. The Indian IT service industry offers IT solutions to some top-notch global organizations to increase their productivity in order to generate more wealth.

**Quality Assurance in India**

The IT companies adopt very stringent quality norms in IT development, so that they can offer high quality, very competent IT products, services or solutions to their client organizations. Otherwise the IT companies in India cannot sustain in the competitive global markets, where competition arises from other low-cost countries. Most companies operating from India have adopted international quality norms, and obtained one or more international quality assurances certifications, like, ISO-9001 family of standards. But, merely holding ISO-9001 certification does not ensure that the IT service company offers quality products or services to highly competitive marketplace. Most significant measure for software development companies, is the Capability Maturity Model of Software Engineering Institute (of Carnegie Mellon University), which gets reduced to SEI-CMM, SEI-CMMI and SEI-PCMM. There are five levels of maturity, with a maturity level being a well-defined attainment that points toward achieving a mature software development and support process. The highest level is SEI-CMM Level 5. India has achieved that level of maturity and have highest percentage of such companies. India’s top 20 IT companies and few others have achieved Level 5 quality compliance, either in CMM, CMMI or PCMM. These Level 5 companies in India have already moved up the value-chain. Whereas other IT service companies are comparatively low in value-addition but slowly moving up the value-chain. India government undertakes many initiatives to
promote IT service industry in the country; one such is establishment of software technology parks (STP) in various cities. More than 15 STP centers have already been established since 1990. STP is a 100% export oriented scheme for the development and export of computer software including export of professional services using communication links or physical media. The unique feature of STP scheme is the provisioning of single-point contact services for the member units enabling them to conduct export operation at a pace commensurate with international practices. This scheme facilitates software export industry in general and small and medium enterprises (SMEs) in particular, thereby accelerating the economic growth of the country by maintaining a competitive edge in the global market. Software Technology Parks of India (STPI) was set-up in 1991 to implement the STP scheme for the promotion and advancement in IT exports by providing general infrastructure facilities like ready to use build-up space, centralized computing facilities and high-speed data communication links.

National Association of Software & Service Companies (NASSCOM) is an umbrella organization for IT services companies and IT-enabled services companies in India. As on 31st March 2004, more than 860 IT companies in India are members of NASSCOM. The combined revenue of NASSCOM member companies constitutes almost 95 percent of the revenue of the IT software and services industry in India. The membership profile ranges from privately owned companies to public sector companies. Membership includes domestic IT companies as well as multinational companies operating in India. The wide range of member companies gives NASSCOM the strength and diversity to represent the industry with authority. But, many small IT
companies are not members of this association due to some reasons or others.

**Graph-2.1: Software Exports from Karnataka (in US Billion $)**

![Graph showing software exports from Karnataka](image)

*Source: Information and Communication Technology Policy GOK, 2011*

There is no single official statistics on IT service revenues in India. Ministry of Communication and Information Technology provides the official statistics,. NASSCOM asserts that its member companies are responsible for more than 90% export revenues. On the other hand, STPI claims that its registered companies are responsible for more than 80% IT services export revenues. This happens because many companies are members of both the organizations. In 2003-2004 the Indian top 20 IT Companies earned US$ 10.2 billion in revenues out of total revenues of Indian IT service industry of US$ 20.4 billion. The average annual growth rate of IT service industry in India is 15 to 20%.

### 2.3 KARNATAKA STATE AND GROWTH OF IT:

Majority of IT activity in Karnataka is concentrated in Bangalore. Bangalore is also referred to as the Silicon Valley of India. NASDAQ
opened its office in Bangalore on Feb 12, 2001. This was seen as a major recognition for Bangalore. The Software Technology Park (STP) plays a big role in encouraging this industry in Karnataka. Other STP centers in Karnataka are, Hubli and Mangalore.

Karnataka State especially, Bangalore, emerged as a major centre of global software outsourcing and other IT-related services in India due to the availability of skilled technical and scientific manpower in its public sector industries and laboratories as well as good communication facilities. The advent of the software industry in the city is usually traced to the late 1980s, when Texas Instruments set up the first satellite data link and established a software development centre in the city. There after number of Computer software industries took advantage of the infrastructure and the availability of cheap technical manpower. Simultaneously, the early Indian software companies such as Infosys, Tata Consultancy Services (TCS) and Wipro established themselves primarily by getting contracts from foreign companies (mostly U.S.-based) to provide onsite software services. After a period of slow growth, mostly led by multinationals (MNCs) investing in IT, the industry took off in the 1990s due to liberalization, improvements in telecom infrastructure, and a favorable global economic climate. The establishment of the first STP (Software Technology Park) at Bangalore gave a major boost to the industry, and the post-1991 period saw the emergence of offshore ‘software factories’ both domestic and multinational, as well as numerous small and medium sized firms.¹ Bangalore now hosts a number of offshore development centres (ODCs) and subsidiaries of multinationals, as well as large campuses of the

¹ Carol Upadhya & A.R. Vasavi Final Report Submitted to Indo-Dutch programme for alternatives in Development Work, Culture, and Sociality in the Indian it Industry: a Sociological Study August 2006 School of Social Sciences, National Institute of Advanced Studies Indian Institute of Science Campus, Bangalore 560 012 India.
major Indian players such as Infosys and Wipro. MNCs that have established ODCs in Bangalore include U.S.-based companies such as IBM, Intel, HP, Sun, Oracle, Cisco, Texas Instruments, European companies such as SAP, Philips, Siemens, and Robert Bosch, as well as a few Chinese and Japanese companies. There were about seventy MNC in the city as of 2005, but more and more MNCs are opening development centres in Bangalore, or expanding existing facilities. The official ‘FE’ (foreign equity participation) category also includes a number of smaller firms that have been started by Indians (and some by NRIs based in the U.S.) and were funded by venture capital. Although the large software exporters account for the bulk of exports and revenues, the majority of firms in the city (and in the software industry in general) are small to medium sized Indian companies, According to STPI figures, there were 1721 registered software exporting and other IT related firms in Karnataka in 2005-06, including about 200 new firms in that fiscal year, but only around 1200 of them were operational, and the majority are very small firms. However, estimates of the actual number of software firms vary quite a bit because not all firms are registered with the STPI, and even fewer are members of NASSCOM. There are numerous small companies in Bangalore devoted to low-end services such as data entry, website design, computer training, etc, which constitute what might be called the ‘informal sector’ of the IT economy and which are not accounted for by STPI or other government figures. Thus, it is difficult to arrive at a reliable estimate for the number of IT firms in Bangalore, but a rough estimate would place it at around 1200. Karnataka state is the leading exporter of software in the country, with software accounted for Rs 135,000 crore in only Karnataka worth IT exports in 2011-12 and is set to grow by at least 20 per cent in 2012-13.
Table No.2.1: Growth of IT companies in Tier II cities of Karnataka

<table>
<thead>
<tr>
<th>Tier-II Cities</th>
<th>2005-06</th>
<th>2006-07</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mysore</td>
<td>40</td>
<td>392</td>
<td>49</td>
<td>761</td>
<td>53</td>
</tr>
<tr>
<td>Mayiladuthu</td>
<td>24</td>
<td>681</td>
<td>21</td>
<td>1058</td>
<td>56</td>
</tr>
<tr>
<td>Hubli</td>
<td>6</td>
<td>13</td>
<td>9</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: Information and Communication Technology Policy GOK, 2011

As the rapid growth in the IT/IT-enabled services in Bangalore, the symbol of the state’s global reputation, attracted thousands of youngsters from across the country, the real estate sector boomed, bringing in its wake thousands of more low-skilled workers. As a result, there has been enormous pressure on civic services.

The distribution of firms in terms of size is highly skewed: while the majority of firms are small, there are only five firms in the state with revenues of more than Rs 1000 crore.

Table No.2.2: Growth of IT workers in Karnataka

<table>
<thead>
<tr>
<th>Year</th>
<th>Software Workers in Lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>3.8</td>
</tr>
<tr>
<td>2005-06</td>
<td>4.21</td>
</tr>
<tr>
<td>2006-07</td>
<td>4.5</td>
</tr>
<tr>
<td>2007-08</td>
<td>5.2</td>
</tr>
<tr>
<td>2008-09</td>
<td>5.54</td>
</tr>
</tbody>
</table>

Source: STPI Web site.
The widely accepted figure for software engineers in Bangalore in 2004 was about 115,000, plus about 30,000-40,000 ITES workers, bringing the total IT workforce to about 150,000. But these figures are probably collected only from registered companies it is not clear whether they include contract workers and informal sector workers, or even those in very small companies with less than five employees. According to a recent STPI press release, 35,000 IT professionals were recruited in Karnataka during the period April to December 2005, taking employment in the IT sector in the state to 3.2 lakh. Based on these figures, the number of IT employees (including ITES) in Bangalore may be estimated at around 200,000 to 250,000, out of a population of about 7 million. The account of work, employment, and the workforce in the IT industry presented in the following chapters is based primarily on research conducted in Bangalore. Although on some issues it may be unwise to generalize from the study of one city to the entire IT sector in India, we assume that many of the features described here are common throughout the industry. The main distinguishing characteristic of Bangalore that may produce some differences, however, is the fact that it is widely regarded as the premier centre for the IT and ITES industries in the country, as well as the industry’s high visibility. Unlike Mumbai and Delhi, which have developed thriving IT sectors within more diversified and older industrial economies, Bangalore has become rather ‘IT centric’ (despite the fact that there are other important industries in the city that employ larger workforces, such as garment manufacturing). Bangalore’s reputation as India’s ‘Silicon Valley’ attracts both IT professionals and prospective BPO employees to the city in search of work, and continues to lure companies to establish or expand operations, despite their complaints about poor infrastructure. The result has been a rather overheated job market in which many
companies compete for well-qualified employees, even while IT professionals vie for the best jobs. In addition, Bangalore’s IT-centricity has imparted a level of visibility to IT professionals and BPO employees that they perhaps do not enjoy in other cities. They are clearly distinguishable by their lifestyles, and are regarded by the wider society as something of a *nouveau riche* class (for which reason software engineers have become a favorite target of petty criminals – reports of thefts and muggings for cell phones, cash and credit cards being daily fare in the local newspapers). According to NASSCOM, there are just three to four ‘Tier I’ companies in India with revenues exceeding $1 billion, but they account for 45 per cent of IT services export revenues. The seven to ten Tier Two players with revenues USD 100 million-USD 1 billion account for another 25 per cent, while the offshore operations of MNCs account for 10-15 per cent. That leaves less than 20 per cent of the pie for the hundreds of small and medium companies.

**Graph No.2.3: Growth of IT Companies in Karnataka**

Source: Information and Communication Technology Policy GOK, 2011

**2.4 NATURE OF WORK FORCE IN THE SOFTWARE INDUSTRY:**

At the most general level, software engineers, call centre agents and others employed in India’s IT and ITES industries can be said to
constitute a new ‘knowledge’ workforce that caters to the global informational economy. The advent of the information economy has transformed the labour market, generating demands for certain information goods and services, and therefore for specific kinds of skills and specialized labour, worldwide. Two basic kinds of services are in increasing demand -- software and IT enabled services. Due to competition, developed country firms are outsourcing many IT and ITES activities to low cost locations in the developing world, transforming the labour market in countries such as India (Basant, Rakhesh and Rani 2004).²

In order to understand the structure and characteristics of this new workforce, it is necessary to distinguish among the wide range of jobs, types of work and employment conditions that are encompassed within the category of ‘IT’ -- from ‘high-end’ computer science research to very ‘low-end’ services such as data entry and back office processes. This chapter outlines the key features of the IT industry that shape the demand for different types of labor; describes the various kinds of IT work, jobs and employers of IT workers in India, and discusses the main characteristics of the workforce and work in this industry – flexibility, mobility, and virtuality.

2.4.1 Types of Computer Software Work and Jobs

The software business is usually divided into three major categories: software solutions, products, and services. However, the major distinction usually referred to by software engineers is that between ‘projects’ (software services, such as tailoring applications to client requirements) and ‘products’ (development of a software package or product for sale). This division of software production into ‘services’

² Source- Basant and Rani (2004:5323), based on NSSO 55th round data.
versus ‘products’ arose due to the trend towards the customization of software, in which generic products are tailored to the specific requirements of customers. This distinction roughly corresponds to the difference between ‘high-end’ (which includes products and consultancy as well as research) and ‘low-end’ work (generic software services for customers). While the distinction between high- and low-end works is not hard and fast, it refers to the fact that as one moves down the steps of the software development process, from conceptualization, design and analysis, to coding, testing, delivery/ installation and maintenance, the skill requirements reduce.

Consultancy, analysis of requirements, and design require a higher level of skill and/or domain and market knowledge, whereas coding, testing, and maintenance are labor-intensive but low-skill processes. Because the stages of software development have become well defined over time, they can be undertaken as separate projects or units in different locations, and by different teams or companies. This has led to a pattern of geographical dispersion of software production and services in which low-end, labor-intensive processes are delinked from the software development cycle and outsourced to low-cost locations such as India (Rothboeck et.al. 2001:15-16) \(^3\). The outsourcing of software development took off especially in the 1990s due to the increasing complexity of software requirements, the trend towards customization, and the enhanced viability of breaking up the production process into small parts, as well as of outsourcing and off shoring of these services.

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As noted above, the Indian software industry has tended to specialize in low-end services, although the ODCs (Offshore development centers) of several multinationals have taken on higher end work, and the major Indian companies have moved into consultancy and are able to execute end-to-end projects. In fact, the range of software-related activities carried out by companies in India is more diverse than the low-end / high-end dichotomy suggests, and individual companies may be engaged in several different activities at the same time. ITES (IT enabled services) is often categorized under low-end IT services, but because it is a very different type of business, it is treated separately in this report. ‘Lowed’ should also include the large ‘informal sector’ of the IT industry, such as the ‘body shops’ or employment consultants who contract out software labor; there are many small DTP/ Xerox shops and internet cafes that dot India’s towns and cities; small computer training institutes; and the very small companies that take on subcontracted work such as small web design or data processing projects. The segment of the IT labor force that works in such companies is particularly insecure and mobile, and paid less. Although there may be a large number of computer programmers and other trained software professionals.
Box II.1. Descriptions of Core IT Workers

Computer Scientists

Computer scientists generally design computers and conduct research to improve their design or use, and develop and adapt principles for applying computers to new uses. They are distinguished from other computer professionals by the higher level of theoretical expertise and innovation they apply to complex problems and the creation or application of new technology. Computer scientists employed by academic institutions work in areas ranging from theory, to hardware, to language design. Some work on multidisciplinary projects, such as developing and advancing uses for virtual reality. Computer scientists in private industry work in areas such as applying theory, developing specialized languages, or designing programming tools, knowledge-based systems, or computer games.

Computer Engineers

Computer engineers work with the hardware and software aspects of systems design and development. Computer engineers may often work as part of a team that designs new computing devices or computer-related equipment. Software engineers design and develop both packaged and systems software.

Systems Analysts

Systems analysts use their knowledge and skills in a problem solving capacity, implementing the means for computer technology to meet the individual needs of an organization. They study business, scientific, or engineering data processing problems and design new solution using computers. This process may include planning and developing new computer systems or devising ways to apply existing systems to operations still completed manually or by some less efficient method. Systems analysts may design entirely new systems, including both hardware and software, or add a single new software application to harness more of the computer’s power. They work to help an organization realize the maximum benefit from its investment in equipment, personnel, and business processes.
Professionals employed in this ‘informal’ IT economy, studies of the IT workforce initiated by industry bodies such as NASSCOM have tended to ignore this segment, focusing instead on the well-qualified engineers employed in the large companies and MNCs, and the growing demand for employees in this segment. Because existing surveys of IT professionals have failed to capture this heterogeneity in the job market, we do not have adequate data on the size, composition and stratification of the IT workforce. NSSO (National Sample Survey Organization) data for 1999-2000 show that 38 per cent of ‘IT occupation workers’ are employed in small, informal enterprises (proprietorships or partnership firms), 25 per cent in public limited companies, and 28 per cent in private limited companies -- indicating that small firms participate in the labor market in significant manner. While the distribution of revenues is skewed in favor of large firms in the IT

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**Computer Programmers**

Computer programmers write and maintain the detailed instructions, called “programs” or “software,” that lists in logical order the steps that computers must execute to perform their functions. In many large organizations, computer programmers follow descriptions prepared by systems analysts who have studied the task that the computer system is going to perform. The transition from a mainframe to a primarily PC-based environment has blurred the once rigid distinction between the programmer and the user. Increasingly adept users are taking over many of the tasks previously performed by computer programmers. A growing number of sophisticated software packages allow users and systems analysts to write programs.

*Source: Bureau of Labour Statistics, United States Department of Labour, adapted from Meares et al., 1999.*
industry, employment of IT workers is fairly evenly distributed across small and large enterprises. The present study has not captured the entire range of software work, but has concentrated on the ‘organised’ and export-oriented sector of the IT industry – especially the registered Indian (large, medium and small) and multinational software and BPO companies. This focus was deliberate because the aim of the study was to understand the culture and impact of a global industry in India. For the same reason, the study has not captured the large segment of IT workers who cater to the domestic market or who are in house staff of non-IT companies (including public sector companies and organisations). While the number of IT professionals working in export-oriented software services and products is about 3.5 lakh (350,000), another 3.5 lakh are employed in the domestic sector or are captive in-house staff. In the ITES-BPO sector as well, there are some units that cater to the domestic market, but our research has focused entirely on the export-oriented sector.

According to NSSO data, 40 per cent of IT professionals work in user organisations, compared to 32 per cent in exports. (Basant, Rakesh and Rani) (2004) argue that this represents the diffusion of IT workers into other sectors and hence a “deepening” of the labour market.

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Table 2.3: IT related occupations in the Standard Occupational Classification

| Engineers, science, and computer systems managers | Electrical and electronics engineers |
| Database administrators | Computer engineers |
| Systems analysts | Computer support specialists |
| Computer programmers | All other computer scientists |
| Broadcast technicians | Electrical and electronics technicians |
| Computer equipment operators | Duplicating, mail and other office machine operators |
| Data processing equipment repairers | Billing, posting, & calculating machine operators |
| Communications equipment operators | |
| Electric power line installers and repairers | Data entry keyers |
| Telephone and cable TV installers and repairers | Electronics repairers, commercial industrial equipment operators |
| Central office and PBX installers and repairers | Electrical and electronic equipment assemblers, precision |
| Electromechanical equipment assemblers, precision | Electronic semiconductor processors |


2.5 EMPLOYERS AND TYPES OF EMPLOYMENT:

Software firms in India are usually classified into three categories -- small/medium enterprises (SMEs), major Indian companies (MICs), and multinationals or firms with foreign equity participation (MNCs/FEs). The major Indian companies include the well known global services providers such as Infosys, Tata Consultancy Services (TCS), and Wipro, while the SME category includes a wide range in terms of size – from ten up to 1000 employees. This categorization, however, is unsatisfactory, for it confflates two different dimensions - ownership (Indian or foreign) and size. According to the STPI
definition, firms in the ‘SME’ category are all Indian owned, while those in the MNC category may be subsidiaries of large multinationals such as Intel or IBM with several thousand employees in India, or they may be small venture capital-funded startups (registered outside of India) with less than twenty employees. In selecting the sample for this study, we attempted to capture companies and employees across the range in both dimensions -- MNCs as well as Indian, and small, medium, and large companies.

The experience of working in IT varies considerably depending on the type and size of company. While the large services companies have workforces of 50,000 or more, spread across several centers in India and many locations abroad, there are many small and medium size companies with workforces of less than 500. At the time of the research (2004-05), most of the MNC development centers had workforces of between 500 and 1000, but they have been ramping up rapidly over the last couple years (many at the rate of 30 per cent this year), so that several ODCs in Bangalore now have workforces of 1500-2000 or more. While the large Indian companies and MNCs dominate exports and employ a large proportion of software engineers, the majority of software firms are small, with less than fifty employees. In addition, as mentioned above, there are many small companies and enterprises, registered and unregistered, with workforces of twenty or less, and an unknown number of temporary workers who are employed in the large companies on contract basis through employment agencies. This is one reason why it is difficult to get reliable estimates of the size of the workforce. Most of the large Indian companies focus on software

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services outsourcing, and most of their clients and customers are located in North America, but increasingly also in Europe and in East and Southeast Asia. Companies such as Infosys and Wipro have perfected the ‘global services delivery model’, in which large outsourced software projects are executed across several locations. The Indian software services industry started out with ‘body shopping’ – a system in which companies send teams of software engineers to the customer site – but an increasing proportion of work is now being performed ‘offshore’ (in India), rather than ‘onsite’ (except during the ‘Y2K crisis’ of 1998-99, which saw a revival of body shopping due to the heavy demand for programmers in the U.S. and other developed countries). After the establishment of satellite links, it became possible to perform much of the outsourced work offshore, further reducing labour costs as well as the time needed for completion of projects. Under the ‘global delivery model’, the full 24 hours of the day can be utilized, taking advantage of the time difference between India. This is the classification used by STPI (Software Technology Parks of India), the semiautonomous government agency that acts as a clearing house for companies wishing to set up IT operations in India, and the U.S. (Parthasarathy 2005; Rothboeck, et.al. 2001:20-21). The magnitude of this shift is shown by the fact that in 1990-91, 90 per cent of Indian software and service export revenues came from onsite work and only 5 per cent from offshore, whereas by 2002-03 the proportion had changed to 39 per cent onsite and 58 per cent offshore (estimated; Basant, Rakhesh and Rani 2004:5318). According to an employee of a

7 Source : Final Report submitted to Indo Dutch Programme for Alternatives in Development on WORK, CULTURE, AND SOCIALITY IN THE INDIAN IT INDUSTRY: A SOCIOLOGICAL STUDY by Carol Upadhyay A.R. Vasavi August 2006, School of Social Sciences, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore 560 012 India.
8 Op.Cit, - Page
large services Company, the typical model now is 70:30 offshore/onsite work, but this varies depending on the type of project. The large software companies primarily provide ‘generic’ services they are able to take on a wide range of software development, maintenance, testing and other types of projects, on many different platforms and in diverse ‘domain’ areas. While the Indian industry has concentrated on the low end of the software development cycle (coding, testing, and maintenance) the high end of design work being retained by the client or outsourced to another company with the shift to the offshore model the large Indian companies have established their reputations in the global market and have taken on more complex projects. Several companies have ‘moved up the value chain’ into consultancy and some amount of design work is being done in India now, but still only a few Indian companies, such as i-Flex, have successfully produced products for the global market (Rothboeck, et.al. 2001; Heeks 1996).9

Many of the small and medium size software companies follow the same outsourcing model, but because of their size they tend to specialise in particular domains (such as financial services), in particular functions (such as networking), or in particular platforms (such as Java). Many small companies also provide low-end generic services, but another category of small company consists of venture capital-funded startups that are developing products, independently or under contract to MNCs. Thus there is a wide range of skills required by small companies, from relatively unskilled generic programmers and testers to highly qualified computer scientists, depending on the type of company and work. While most Indian companies are software services providers, most MNC overseas development centers in India are

9 Op.Cit, - Page
working on software products for the parent company’s IT products or on embedded software for non-computer products. For this reason, many software engineers prefer jobs with MNCs, where they are more likely to get not only better pay but also more challenging work. However, even within the MNCs a range of skill levels are tapped, from Ph.D.’s in computer science for the few research positions, to ordinary graduates with MCA degrees (Master of Computer Applications) who are employed for simpler work such as testing. Despite some moves towards higher value-added work, the Indian software industry continues to be dominated by software services, with engineering services, R&D and products together constituting only 18 per cent of total software and services exports in fiscal 2005. Several senior industry insiders acknowledged that the Indian industry continues to concentrate on the low end of software services, in spite of the fact that the large services companies have been attempting to create a different image of their work. According to another source, products and packages accounted for only 4.1 per cent of software and services exports in 2001-02 (Basant, Rakhesh and Rani 2004:5318).\textsuperscript{10} by stressing their move into consultancy and their ability to execute end-to-end projects.

Moreover, the difference in labor cost is still a major competitive advantage of the Indian industry in the global market, which is one reason why even the large American software services outsourcing companies such as IBM Global and EDS have established centers in India. While the industry is concerned that rising salaries will erase this advantage (due to competition for scarce skilled labour among companies), one study shows that there is convergence only of high-end

\textsuperscript{10} Op.Cit, - Page
salaries while salaries for low-end jobs remain very competitive (Kumar 2000a, quoted in Rothboeck et.al. 2001:23). 11

2.5.1 Nature of Employment and Work

The type of work and terms and conditions of employment vary widely in the industry, depending largely on the type of company and type and location of work. As noted above, the largest employers of software engineers and other IT professionals are the four major software services companies with revenues of more than US$ 1 billion. With workforces of more than 50,000 each, they corner a large share of the software labor market. These companies provide a range of software services primarily to customers outside of India, including software development, enterprise applications, systems maintenance, and so on. Fresh recruits in these companies typically are posted to one of the Indian offices after the training period, where they work for one or two years before getting their first ‘onsite’ assignment.

Most software engineers are sent on such assignments several times in their careers, which range from short-term stints of a few weeks to a few months, to long-term assignments of a year or more. However, with the trend towards off shoring, often only one or two team members on a project are deputed to the customer’s site. A key feature of work in these companies is the fact that they are services companies, which depend on contracts with customers to carry out projects. As in any service industry, customer satisfaction is a top

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11 Source: Final Report submitted to Indo-Dutch Programme for Alternatives in Development on WORK, CULTURE, AND SOCIALITY IN THE INDIAN IT INDUSTRY: A SOCIOLOGICAL STUDY by Carol Upadhya A.R. Vasavi August 2006, School of Social Sciences, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore 560 012 India.
priority, and employees are given extensive training and orientation towards this end.

Table No-4: Distinguishing IT workers from IT enabled workers

![Diagram of IT workers vs IT enabled workers]

*Source: Freeman and Aspray, 1999.*

Most of the MNC, ODCs in India differ from the Indian services companies in at least two important respects. First, they generally work on product development projects for their parent companies. Although in many cases the Indian teams are consigned to lower-end coding and testing of software products, a few companies have substantial research divisions and execute complete projects in Bangalore. Second, the nature of relationship with the ‘customer’ (the parent company or a division of it) differs: although in most cases, technically an Indian ODC is an independent entity for whom the parent company is the ‘customer’, it is not a strict ‘service’ relationship and so there is less emphasis on customer satisfaction compared to services companies.
Because MNC employees are not catering to external customers, their work is generally perceived to be less demanding. Like software engineers employed by Indian services companies, MNC employees also travel abroad, usually to another office of the parent company for training, ‘transfer of technology’, or other such assignments. The length of stay abroad is often shorter than in the case of onsite assignments. However, much of their work is carried out through ‘virtual teams’.

Employees of large Indian services, consultancy, and products companies and MNC ODCs can be considered to be the ‘cream’ of the software profession. At the lower end are those who work in small companies (except for high-end startups) or as temporary workers, whose jobs are less well-paid and quite insecure due to the high level of instability of companies in this industry. The lowest end of the Indian software services industry is ‘body shopping’, a system of contract labor in which employment consultants in India recruit software engineers and place them with clients abroad to work on specific projects, taking a large cut of their salaries as their fee. In this system, the Indian companies simply supply software professionals (‘bodies’) according to given specifications, who are then supervised by the local contracting company. ‘Body shopped’ techies provide a relatively cheap source of skilled labor for businesses in the U.S. and other developed countries. By supplying software professionals temporarily and only for the length of time needed, body shops help companies to reduce the costs of keeping a large permanent labour force or of contracting out the work locally (Xiang 2001, 2002).12 This is true for all forms of temporary contract labour organized by recruitment agencies, but the transnational character of work in this case adds an element of temporary migration.

Body shopping exemplifies the regime of flexible labour, and is analogous to the ‘just-in-time’ production techniques characteristic of the postindustrial economy (Aneesh 2001a:358). In body shopping arrangements, Indian engineers work only onsite, along with direct employees of the customer, and there is no offshore component. While the employment conditions, compensation, and nature of contract are determined by the consultant, the actual work is managed by the customer. The Indian engineers are employees of the contracting Indian company, with whom they sign a contract to work at a specified hourly rate. The consultant company in turn signs a contract with the customer or with another consultant company in the receiving country to supply the workers at a given hourly rate, which is of course much higher than what the engineer is being paid. The Indian employer usually arranges for the employee’s travel, visa, and accommodation, and pays a basic monthly maintenance allowance when he or she is between assignments (‘on the bench’). The engineer is paid at the contracted rate only when s/he is actually working. Typically, body shopped software engineers carry out low-end maintenance or coding jobs. In these arrangements, the engineer is usually allowed to stay in the receiving country only as long as he is employed by the original contractor. However, it may be possible for a body shopped techie to change jobs if he (or rarely, she) has a job offer from the customer or another company willing to sponsor his visa and work permit. It is through this route that a number of techies have been able to stay back in Europe (and the U.S.) as temporary or permanent employees of local companies. The incidence of body shopping has diminished over time as customers now

13 Aneesh, A. 2001a. Rethinking migration: on-line labor flows from India to the United States. In W.A. Cornelius, et.al. (eds.), The International Migration of the Highly Skilled. La Jolla; Center for Comparative Immigration Studies, University of California, San Diego, pp. 351-70.
prefer to give contracts to the large and software services companies, which offer offshore services as well. But there continues to be some amount of body shopping from India, especially to smaller companies. Increasingly significant is the incidence of local body shopping, in which temporary workers are supplied by consultants to software and other companies within India.

2.5.2 Mobility of Workers and Work

The key characteristics of the IT workforce flow largely from its role in the global ‘informational’ economy, which requires workers who are mobile and flexible but which at the same time has created a new category of ‘virtual’ workers who work remotely from different ‘geographies’. As discussed above, the major trend in the outsourcing industry is towards offshoring: instead of workers moving to where the jobs are, as in the earlier ‘body shopping’ phase of the industry, jobs increasingly are moving to where the workers are, who work remotely with colleagues and clients in other locations, most of whom they will never meet in person. Thus, while the global IT economy makes use of various forms of mobile labor, it is also producing new forms of labor immobility. Which type of labor is deployed, and in what combinations, varies according to the type of company and the nature of the project and work.

Geographical mobility The Indian IT industry grew up on the basis of body shopping, or mobile labour. The earliest companies fulfilled their contracts for software services primarily by sending software engineers to the customer site. While the 1990s saw the beginning of the move towards offshoring, the Y2K crisis gave a new lease on life to the body shopping system, as software engineers with certain ‘skill sets’ (such as familiarity with Unix) were in great demand.
in the U.S. and Europe. As a result of body shopping as well as the migration of more highly-skilled engineers, there are many Indian software professionals living and working outside of India, mainly in the U.S. and other developed countries. In addition to these long-term and permanent migrants, most software engineers based in India travel abroad at intervals for onsite assignments or other kinds of work. Indeed, foreign travel, and the ‘exposure’ to Western countries that it affords, is considered to be one of the most attractive and significant perquisites of IT work. Geographical mobility (especially onsite work) continues to be a significant feature of the software industry, despite the gradual shift towards off shoring.

Employees of Indian software services companies travel more than those of products companies and MNCs. The vast majority of foreign assignments were in the U.S., followed by Germany and the U.K. While the U.S. clearly dominates the market for Indian software companies, our respondents together had visited 23 different countries, from Greece to Thailand to Australia. Most of the assignments for which foreign travel was undertaken were for onsite coordination work, systems maintenance, gathering of requirements from customers, software development and installation/deployment. In addition, employees of MNCs frequently are sent to the parent company for ‘transfer of technology’ assignments, training, and cultural exposure. Very few of the respondents had been sent abroad for design or conceptualization work. The majority of assignments were of two weeks to three months duration, followed by three months to one year. Employees of MNCs had more short-term assignments (less than three months) compared to those of the Indian services companies, and women had been on fewer long-term assignments than men. Onsite
Assignments are highly desired by IT professionals for several reasons. First, they get international ‘exposure’, which adds to their resumes. Second, it is possible to save a substantial amount of money. Engineers on short-term projects continue to get their Indian salary, which becomes a saving, plus they receive a daily allowance to spend while abroad, much of which they can bring back to India, virtually tax-free. Those on long term projects usually do not get their Indian salaries but are paid local salaries (in local currency) at the prevailing rate, but they are still usually able to save a lot of money to bring back to India. Techies attempt to live frugally while abroad in order to save money. We were told that onsite workers are usually able to save Rs 100,000 to 200,000 by working in the U.S. for three months.

Apart from their foreign travel experience, software engineers are also highly mobile within India. The younger, unmarried male engineers in particular are willing to go wherever their work leads them, or where they get the best job offer. Geographical relocation may be due to change of job or transfer within the same company, which is common especially in the large services companies. These factors work together to create a high level of physical mobility among software professionals: more than one-third of our survey respondents had worked in at least two other places apart from Bangalore.

**Virtual migration** While the Indian IT workforce is clearly quite mobile within the global economy, due to offshoring and the geographically dispersed nature of the software outsourcing industry, the physical mobility or circulation of workers is becoming less significant. New forms of mobility have appeared and become central to the way in which the production and distribution of goods and services are organized globally especially the mobility of ‘knowledge work’ minus
the body of the worker. The spread of sophisticated information and communications technologies has enabled a large proportion of work in outsourced projects including software development and testing, systems maintenance, and so on -- to be performed remotely or ‘virtually’. As noted above, taking advantage of this possibility to reduce costs and provide round-the-clock services, the Indian software outsourcing industry has moved rapidly towards the offshore model, reducing the need for software engineers to move physically among different locations. In the model typically followed today, software engineers located in India are linked into the computer networks of their customers abroad, working on projects as part of ‘virtual teams’ consisting of colleagues, managers and customers spread across several geographical locations. This characteristic of software outsourcing, which is perhaps more significant than the physical mobility of software engineers, has been described by Aneesh (2001a, 2006)\(^{14}\) as ‘virtual migration’. He suggests that online software services should be understood as labor flows rather than movement of goods and services (as is usually done), because offshore services is basically a technique for supplying labor that is analogous to onsite work or body shopping. He points out that Indian software services companies are not for the most part supplying products but services (i.e., labor), and that similar work is done through both routes. The main thrust of his argument is that ‘labor migration’ no longer necessarily requires the movement of bodies, and that globalizing forces can also produce localizing effects by restricting laboring populations to their national territories. This kind of offshore/online virtual work is one of the major developments that has

\(^{14}\) Aneesh, A. 2001a. Rethinking migration: on-line labor flows from India to the United States. In W.A. Cornelius, et.al. (eds.), The International Migration of the Highly Skilled. La Jolla; Center for Comparative immigration Studies, University of California, San Diego, pp. 351-70.
been enabled by the new ICTs. One of the significant features of online labor is that programmers are directly connected to their clients’ machines, so that the client is able to monitor progress, check the quality of the work, and communicate with programmers as if they were on site. It also enables work to be carried out round-the-clock. Thus, although the Indian software labor force is still geographically mobile to a large extent, it is becoming increasingly immobilized as more work is performed offshore. Or to put it more accurately, the bodies of workers are immobilized, since in many ways they are working elsewhere even while sitting in Bangalore or Mumbai, connected through computer and satellite link to their customers and colleagues located on the other side of the globe. While software companies still need to place at least a few engineers at customer sites in order to execute projects, the immobilization of workers is almost total in the case of IT enabled services, which are performed completely offshore. The phenomenon of virtual migration is most visible in the call centers and BPOs, whose agents spend almost their entire working days or nights interacting with foreign customers or engaged in work for clients outside of India. As Gephart (2002)\textsuperscript{15} notes, digitalization has facilitated the flexibilisation of labour as well as the virtualization and rationalization of the work process, but at the same time a “diffuse mode of work and transnational capital flows affect labour which is culturally tied to a given locale” (Gephart 2002:331).\textsuperscript{16} The virtualisation of labour in the IT industry has had diverse and profound


consequences in terms of the work process, forms of organisational control, and work culture.

2.6 PRODUCING THE INDIAN SOFTWARE WORK FORCE:

By 2006, the Indian IT industry had generated employment for an estimated one million people. The rapid growth of the industry, and the lucrative job opportunities that it provides, has made IT a premium career option for young people, and there is stiff competition for entry into software companies. However, from the industry perspective there is a dearth of qualified people, and too many jobs chasing too few people has led to rising salaries, potentially reducing India’s competitive edge. According to manpower consultants, there is already a 20 per cent shortfall in availability of software engineers, and NASSCOM estimates that the industry will need another 1.3 million people by 2010.17 Although India churns out a large number of engineering and computer science graduates as well as diploma and degree holders in IT-related subjects each year, a sizeable proportion of them are not considered suitable to be absorbed by the industry, or are employable only in low-level jobs. Further, while the BPO industry has also been identified as a major future source of employment for India’s educated youth, these companies are also facing a shortage of workers with the appropriate skills and dispositions, despite the large number of unemployed graduates available. Identifying the reasons for this mismatch between the supply and demand for IT workers, and developing strategies to produce more qualified ‘knowledge workers’, has become a central concern of the industry as well as the government.

17 Source: Final Report submitted to Indo-Dutch Programme for Alternatives in Development on WORK, CULTURE, AND SOCIALITY IN THE INDIAN IT INDUSTRY: A SOCIOLOGICAL STUDY by Carol Upadhya A.R. Vasavi August 2006, School of Social Sciences, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore 560 012 India.
Their focus has been on the quality of education and the need to produce more workers with the appropriate skill sets. However, apart from examining the education system, it is also pertinent to investigate whether there are other factors that lead to the exclusion of large numbers of graduates from employment in the IT and ITES industries. For instance, global services outsourcing companies look for certain ‘soft skills’ in their employees as well as technical knowledge. This means that the ‘cultural capital’ possessed by potential employees may be crucial to their success. This includes not only the obvious skills such as fluency in English but also more subtle ones such as the ability and confidence to interact easily in cosmopolitan and multicultural settings – skills that are acquired from one’s family and social background as much as from the education system.

### 2.6.1 The Education System and the IT Industry

Software companies prefer to recruit engineering graduates, of which India produces a large number, creating a large pool of potential manpower. Many come from the southern states of Karnataka, Tamil Nadu and Andhra Pradesh, which have the highest number of engineering colleges (most of them private). Some companies also hire graduates and post-graduates with non-engineering but computer-related degrees, especially science graduates with MCA (Master’s in Computer Applications) degrees, but engineers are still favored. According to a NASSCOM survey in 2004, 67 percent of software professionals hold B. Tech., BE or MCA degrees, 13 percent have M. Tech., MBA, CA, ICWA, etc, degrees, while 20 percent are diploma-holders or simple graduates.\(^{18}\) Although India produces a large number

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\(^{18}\) NASSCOM, ‘Knowledge Professionals – Factsheet’. Accessed at www.nasscom.org, April 2006. It is not clear how many or what kinds of software engineers were covered in this
of engineering graduates each year, there is a mismatch between the output and the requirements of the IT industry. The number of engineering colleges in the country grew from 375 in 1995 to 1208 in 2003, with an annual intake of about 350,000 students. Currently there are more than 3000 institutions in India that offer B.E. and B. Tech. degrees, and about 60 per cent of engineering students take up IT/software related streams as their specialization. But while 290,000 engineering degree and diploma holders enter the workforce annually, according to the 2005 NASSCOM-McKinsey study only about 25 per cent of them (and 10-15 per cent of ordinary graduates) are suitable for employment in the offshore IT-ITES industries.

Several studies of the manpower needs of the industry have been commissioned, all of which highlight the need to produce more software engineers and qualified graduates with the appropriate technical and ‘soft’ skills to meet future requirements. The shortage of suitable engineering graduates is usually attributed to the poor quality of education imparted by many of the engineering institutes. Increasing the supply of qualified IT personnel has been one of the major issues on which the industry has been proactive, both by initiating its own programmes, such as promoting primary education and use of computers in schools, and by putting pressure on the state and technical education bodies to improve the quality and orientation of engineering education. State initiatives have included the

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21 A recent report on higher education in Karnataka has highlighted the oversupply of graduateengineers as well as the overall poor quality of the graduates (Government of Karnataka 2004).
establishment of BITES (Board of IT Education and Standards) and the AICTE (All India Council for Technical Education), and programmes such as the 1500 crore Technical Education Quality Improvement Programme (TEQIP) supported by World Bank. On the industry side, NASSCOM has been conducting an annual HR Summit to provide a forum for industry to interface with academia to develop solutions to the industry’s ‘HR challenges’. It has launched an ‘IT Workforce Development Initiative’, designed “… to focus sharply on the creation and nurturing of the human resources”, and has also signed a Memorandum of Understanding (MoU) with the University Grants Commission (UGC) to jointly undertake a ‘Faculty Development Programme’ to upgrade the knowledge and skills of existing technical faculty. It is not clear how many or what kinds of software engineers were covered in this survey, and it is rather surprising that 20 per cent are simple graduates or diploma holders. See, for example, Government of India (2003), NASSCOM (2004), and NASSCOM’s annual surveys of knowledge professionals (available on NASSCOM website). A recent report on higher education in Karnataka has highlighted the oversupply of graduate engineers as well as the overall poor quality of the graduates (Government of Karnataka 2004). partnership with the industry.

Apart from these NASSCOM initiatives, individual Software companies have entered into collaborations with engineering colleges to help them to revamp their computer programming courses and improve the quality of education. In addition to these efforts to improve technical education, the industry has influenced engineering colleges to introduce soft skills training, such as communication skills.

These steps indicate that engineering education in India is being reoriented to cater to the needs of the IT industry a trend that has been questioned by several academics as well as by other industries. It is important to note here that IT companies prefer to hire engineering graduates not because their training is directly related to the work they will be doing (unless they have studied computer science), but because they believe that they have already been pre-selected for a certain level of intelligence and aptitude. Engineering programmes are also thought to train students in logical thinking, problem solving, and analytical skills, all of which are required in computer programming. That much of the content of engineering education is not directly related to the job profile is shown by the fact that the large outsourcing companies hire graduates from any branch of engineering and then put them through intensive training programmes in software development; most do not even require any prior knowledge of computers for selection. Athreye (2005:159)\(^{23}\) suggests that the preference for engineers is also a means for software companies to signal quality to customers: due to their limited market power, Indian companies try to distinguish themselves from the competition by pointing to the quality of their processes and people (also see Arora and Athreye 2002).\(^{24}\) She argues that the strategy of hiring engineers for software services work represents an “inefficient allocation of resources in a social sense” which also involves negative externalities for other industries by drawing engineers away from them, as well as from public sector research and development institutes. Another reason why software companies prefer to hire engineers is because it is easier to get H1B visas for them a fact that creates a


hierarchy in terms of skills between those who perform onsite and offshore work. The preference for engineering graduates indeed appears to lead to a major waste of educational resources (much of which is government-subsidized, despite the burgeoning of private engineering colleges). Because of the lure of high salaries and plentiful job opportunities in IT, graduate engineers are entering careers for which they have not been trained (and in which they often have no real aptitude or interest), while other industries are finding it difficult to recruit good graduates in chemical or mechanical engineering because most are being absorbed by the IT industry. For instance, the Vishweshwaraya Technical University (VTU) has signed MOUs with organisations such as IBM, Intel, and Microsoft to provide training for faculty, guidance for student projects and the like. These MOUs allow colleges affiliated to the University to get software at subsidized rates, suggesting that there are other motivations for entering into such collaborations other than improving the quality of the workforce.

A study conducted on the Edu Sat Programme in Karnataka’s engineering colleges also indicates universities are not getting enough good students for postgraduate and doctoral courses in the pure sciences because they are all attracted to engineering as a route to the IT industry.25 This trend, they fear, will handicap India’s future efforts in science and technology research and development.33 In the earlier period of the IT boom, a number of private computer training institutes sprang up across India, but the courses offered by these institutes are often of poor quality. Moreover, there is no system of regulation or accreditation, and many students pay handsome fees to become certified as Java or C++ programmers, only to find that they are unable

to get jobs. There is no information about what happens to the degree and diploma holders of these new courses who are not absorbed by the IT industry, but many probably enter the ranks of the ‘informal sector’ of the industry. According to a NASSCOM study, only 2 per cent of all software developers trained in private training institutes joined software firms\(^{26}\). New courses in computer science and computer applications (such as BCS, Bachelor’s in Computer Science) have been introduced by colleges and universities in a belated attempt to catch up with the private institutes in computer training, but most of their graduates also do not pass muster at the recruitment stage. Thus, while MCA degree holders and even diploma holders from reputed institutes such as NIIT are becoming more acceptable for low-end jobs, engineering graduates are still preferred by most companies.

2.7 THE RECRUITMENT PROCESS:

Now the Human resources are considered to be key to the software outsourcing business, and software companies invest much time and money in recruitment, training, and retention of their ‘resources’ – especially during boom periods such as 2004 to the present. IT companies – especially the large Indian services companies – have evolved sophisticated mechanisms for identifying and recruiting personnel with the right mix of technical, communication and social skills. Apart from direct recruitment, an entire ‘ancillary industry’ of employment consultants or ‘head hunters’ has emerged to cater to the manpower needs of the IT industry. IT companies hire both fresh graduates as well as experienced personnel (‘lateral hires’). They

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employ several avenues for recruitment: campus placements, advertising in newspapers and on employment websites, walk-in interviews, through employment consultants, and employee referrals. With the rapid ramp-up in staff strength in most companies over the last couple years, the majority (55-75 per cent) of recruitments in the large companies have been entry level, while the balance 25-45 per cent are experienced workers hired from other companies. Of the entry-level recruits, about 35-40 per cent are sourced through campus recruitment while the balance come through other channels, including temporary staffing.34 Companies vary in their preference for ‘fresher’s.27

The ILO study, carried out several years before this one, also found that the major source of entry-level software engineers is campus recruitment (60-70 per cent).28 The large services companies hire many fresh graduates; some MNCs and products companies prefer only those with three or more years of experience. Regardless of the avenue of recruitment, the screening processes are similar, except that experienced engineers usually do not have to take the written tests that are administered to fresh graduates. Because the large software services companies hire large numbers (15,000-20,000 or more) each year, and have to process a large number of applications, they have streamlined extensive processes for recruitment. For instance, these companies advertise positions periodically, screen the resumes received, and then invite applicants to come for a test or walk-in interview that is held in a number of centers across the country on a single day. We were told that

27 Source: This position was articulated by participants in the National Conference on ‘India’s Competitiveness and Preparedness in Science and Technology’ held at NIAS, October 26-27, 2005.
the success rate through the open competition that is held regularly by one of the software services majors is only about one out of one hundred.

Because of the perceived shortage of skilled software engineers in the last few years, and the sharp competition among companies to recruit the best talent, recruitment has become a key HR function. HR managers refer to recruitment as a ‘marketing’ function, since all the companies are competing for the same small pool of qualified engineers. Recruitment officers interviewed said that they have to “sell themselves” to the techies rather than vice versa, and so they have to understand what candidates are looking for in terms of work or company culture, and accordingly pitch their ‘sale’. Corporate branding is aimed not only at attracting customers but also employees. That such branding can be effective is indicated by the fact that some techies prefer to join a company with a good ‘brand image’ even though they might get a better salary elsewhere. While the bulk of hires come through campus recruitment and the other methods described above, employee referral schemes are a particularly favored method of recruitment. Companies advertise positions on their intranets and employees may refer their friends; if the recruitment is successful the referring employee receives a substantial bonus. This is considered to be a good source of recruits because the employee would have already apprised the candidate about the company and the job requirements, and there would likely be a good ‘fit’ between the two. Many companies get about 25-30 per cent of their new hires through employee referrals, although one MNC claimed that half of their people come through this route. Employee referral schemes draw on existing networks of software professionals that extend across companies and
locations, and which are invoked more generally in the job market as sources of information about employment opportunities. The operation of these social networks in the recruitment process assumes significance in relation to the discussion of processes of exclusion and inclusion in the industry in the following section. As in other fields of social life, social networks not only facilitate cooperation and exchange of information, they may also produce closure and exclusivity and strengthen the monopoly of members over social and economic resources. To the extent that software engineers employed in the larger companies maintain social networks primarily with former classmates and current and former colleagues and information about job opportunities flows primarily through these networks, they may create barriers to new entrants. On the other hand, with the rapid growth of the industry and expansion of the workforce, opportunities are not scarce and salaries are high, so one would not expect to find monopolistic tendencies within the software profession (as has happened historically with other professions).

2.7.1 Campus Placements

Although software companies obtain their human resources through several avenues, the major source is campus recruitment, and it is in this process that filtering mechanisms are most visible. Because of the wide range among engineering institutions and graduates in terms of quality, all the major IT companies have developed their own rankings of engineering colleges, based on external evaluations such as that done by AICTE as well as their own past experiences with hires from those colleges. The rankings of the top fifty colleges are more or less the same for all the companies, which mean that they are competing for a limited pool of well-qualified engineering graduates.
Campuses may be graded into three tiers or on a points/grade scale: ‘Tier One’ or ‘A+’ institutions include the IITs, IIMs, the Indian Institute of Science, BITS Pilani, and a few others. Tier Two or ‘A’ level include the RECs (now the NITs), and the top state campuses such as Delhi College of Engineering and Punjab Engineering College. The good private institutes such as RV College of Engineering in Bangalore and Manipal Institute of Technology are rated Tier Two or B.

The large Indian IT companies and the MNCs are considered to be the best employers and so are able to recruit from the best engineering institutions. The large services companies usually visit the top 50-60 campuses each year; the MNCs and the medium-sized Indian products or services companies may visit about ten select campuses while smaller companies usually go to the same few colleges each year. MNCs prefer to recruit from the ‘Tier I’ institutions such as the IITs, but also must go beyond these in order to fill their requirements. The services companies, on the other hand, focus more on Tier II and III institutions, although they visit all the major campuses. With the large and medium Indian companies and MNCs attracting the best students from the better colleges, smaller firms are forced to hire less qualified candidates, such as science graduates with MCA degrees. The exception to this trend is the small high-end startup companies, who are able to attract well-qualified and experienced people because of the nature of the work that they offer. As noted above, non-engineering graduates face strong entry barriers to big software firms29. Because IT companies are battling for the same pool of candidates, the colleges have instituted complex placement systems in which companies are invited to come in

one after the other to recruit students. The company that comes first is able to pick up the best students, and it is usually the big companies, such as Infosys and Wipro, which get the first slots. The campus placement process is for third year engineering students, which means that they receive offer letters that become valid only after they complete their graduation, in another year. The large companies project their requirements for the coming year and attempt to recruit their projected requirements from campuses; if there is a shortfall, they make up the balance through other methods such as nation-wide walk-in. Apparently, companies have to pay the colleges for their slots, which mean that large companies with more resources can afford to come in first.

This system of advance recruitment has created problems in the past, such as during the downturn of 2001-02 when several companies did not honor the offer letters issued earlier, and fresh graduates were neither able to take up other jobs nor join the companies that had recruited them. By recruiting third-year engineering students, software companies are playing something of a ‘futures’ game, in which they are betting on their estimated future manpower requirements; if their projections are wrong they may not actually take on those who had been recruited a year earlier. But now, with the intense demand for software engineers, companies face the reverse problem of recruits not joining when they finish their degrees. The HR manager of a large services company said that there is a large gap between the number who are given offer letters and the number that actually join.

From the students’ point of view, the campus recruitment system is a mixed blessing. While it provides a guaranteed job after graduation for those selected, it reduces their choice because once a student has
been given an offer, she is not allowed to attend any other company’s interview. Because the more influential companies are invited to come in first, students may be forced to accept offers from companies that are not their first choice, rather than refuse an offer and take a chance that they will be selected by another company. However, some colleges have what is called the ‘Dream Option’, in which recruited students are allowed to pick one other company to apply for a placement. This is done in order to accommodate companies that have later slots in the placement process. Most software companies follow similar campus recruitment procedures. First, only those students with a certain cut-off percentage throughout their course (ranging from 60 to 70 per cent aggregate marks in most cases) are allowed to apply. These students are given a written test, which may be purely technical and based on the engineering syllabus, or may be a test of aptitude and reasoning ability. The software majors usually test reasoning/logical, analytical and problem-solving skills, and sometimes English and mathematics, but not computer skills. Those who pass the test are then asked to participate in a Group Discussion in order to assess their communication skills, personality, and spontaneous thinking abilities.

The candidates who are short-listed after the group discussion are then individually interviewed. There are usually two types of interview, the technical interview and the HR interview. The emphasis in the interview process depends on the kind of job for which the company is recruiting: for a job that involves more customer interface they look for candidates with good communication skills, while for pure development work high marks and technical ability are given more value. But most companies stress that they are looking for ‘learn ability’ rather than knowledge of any particular technology or specific
skills: their software engineers should be able to be trained easily and to pick up new technologies on their own. As noted above, the large software services companies hire engineering graduates from any stream, or MCAs with the right aptitude, and then put them through a thorough entry-level training course. At the entry level, the employees do not even need to have any knowledge of computers. But even the MNCs stress potential to learn rather than prior training, although some of them will hire only computer science graduates or those with post-graduate degrees in the relevant vertical courses.

Apart from ‘learn ability’ and technical aptitude, software companies place great emphasis on attitudes and values, personality, and soft skills. The HR interview round is designed to assess these aspects, including the candidate’s career aspirations, family background, and personality, and to determine whether s/he will fit into the company’s culture and (in some cases) into the group or team for which he is recruited. They also look for candidates with the right attitude being a ‘good team player’ is especially important. HR officers use innovative methods to test these aspects of the candidate’s personality and to ensure that s/he is a good ‘fit’ in the company and would not be ‘disruptive’ in the team. For instance, team skills and level of individualism are gauged by posing mock situations, or by asking about study habits (alone or in a group?) and extracurricular activities (group or individual sports or activities?). As the HR manager of an MNC put it, “A high achiever is not necessarily a team player, the question is whether they will fit into the company”. In smaller companies, the project manager may also be asked to interview the candidate to ensure that s/he fits into the team. MNCs in particular look for ‘cultural fit’ with the company, i.e., in terms of values and
attitudes. One HR manager said that they look for employees who are not only technically sound, but are also ‘confident’, good in communication, and flexible: They should exhibit a great deal of flexibility. They should show willingness to travel to any location, anytime. They should be open about long working hours. Moreover, companies look for engineers with the right ‘attitude’, by which they mean flexibility and malleability.

There are certain tones. Some guys speak as though they can never be assigned to projects that use old technology. A Java skilled guy never wants to learn anything other than Java. Fresher’s always want to be in nice-sounding technologies. But it doesn’t happen that way. Many things continue to use old technology. If they show such an attitude, it is difficult for us. He should be open to learning new things. It is very critical. The interview process is designed to filter out people with “undesirable attributes”. For instance, the candidate is asked whether he or she is willing to work on any project at any location. Only if they are agreeable to this, they proceed. Later when they throw a tantrum, they refer to this and tell them how these issues were already discussed during the interview process, induction program which further orients people about these values.

The second major ‘soft skill’ that is assessed during the HR interview is communication skills. Because most software jobs, especially in the services companies, are ‘client facing’, good oral communication skills are considered to be essential, and a candidate may be rejected purely on the basis of poor communication skills. The first requirement is fluency in English: this is needed not only to be able to deal with foreign customers effectively, but also because the IT workforce is diverse and the only available ‘link language is English,
many companies consider use of vernacular languages in the workplace to be inappropriate. But ‘communication skills’ also includes the ability to converse and interact easily in different social and cultural situations. A common refrain among HR managers is that Indian software engineers are very good technically but are unable to communicate well with clients. The ability not only to understand and communicate with clients about the project, but also to make small talk and socialize with people from different backgrounds, are considered necessary skills for ‘client-facing’ positions in the outsourcing industry. Such skills are critical not only for marketing people but also for software engineers, who need to interact with client’s onsite and during conference calls and teleconferences and be able to understand and solve their problems. The candidate’s ‘ability to mingle’ is assessed during the HR interview, as well as his or her general appearance and demeanor. The close attention that is paid to this stage of the recruitment process suggests that as much importance is given to the personality, communication skills, and social attributes of IT professionals as to their aptitude for computer work, educational background, or technical skills.

2.7.2 Filtering Mechanisms in the Recruitment Process

There are several aspects of the recruitment process followed by IT companies that tend to privilege students from English-speaking, educated, urban and middle class families. Foremost among these is the fact that many IT companies require candidates to have had a consistent average of 70 to 75 per cent marks from 10th standard onwards (and not only in college). This requirement excludes engineering students who may have been allocated seats on government quotas but who were not able to score well in previous examinations because of their educational
and social background. Even if a candidate has shown good results at the college level, this requirement would exclude them from campus recruitment. Students who score high marks in school examinations are mostly from middle class families, urban centers, and private English-medium schools, who have acquired the requisite social and cultural capital to do well in school -- unlike most students from poor, lower caste, and rural backgrounds and government schools. Another mechanism of exclusion are the group and HR interviews that assess spoken English, Communication and social skills, confidence, and personality elements of ‘cultural capital’ that students from urban middle class families are more likely to possess. With the increasing emphasis on soft skills in the industry, candidates from non-metropolitan, non-middle class and lower caste backgrounds are even more likely to be passed over. In response to the argument that recruitment processes tend to exclude certain social types, IT companies point out that they recruit directly through advertisement and walk-in interviews as well as from campuses, so that candidates from any of the colleges can apply, and that anyone is free to send in their resume for screening, regardless of performance in school or college. However, it is not clear how such resumes are screened, especially for fresh graduates, if not on the basis of examination marks -- which would again exclude those from less privileged backgrounds.

One avenue through which those from ordinary engineering colleges or with lower marks may gain entry into the large Companies is by finding employment first in smaller companies or taking up temporary contract jobs. Once a software engineer has acquired some work experience, it may be possible for him or her to land a job in the larger companies, regardless of his or her educational background. One
manager claimed that the academic record is not taken into consideration for those with work experience. Although IT companies often claim that the industry has provided job opportunities to people from a broad cross-section of society, drawing in people from lower middle class, semi-urban, and even rural backgrounds, available evidence suggests to the contrary that the IT workforce is fairly homogeneous in terms of its socio-economic profile (see following section). It is no one’s case that the industry deliberately practices discrimination on the basis of regional, community or other such ‘ascriptive’ identities. But it should be recognized that the requirements of a ‘global’ offshore or outsourcing business tend to exclude those from non-urban and less privileged backgrounds, who lack the social and cultural capital required to work in a ‘global’ environment. Industry leaders themselves acknowledge that there is such a filtering process, in that they have repeatedly urged that appropriate ‘soft skills’ be taught in schools and colleges. HR managers emphasize that gender, regional, caste, community identity are irrelevant in the recruitment process, that the sole criterion is ‘merit’, and that the profile of the workforce will therefore reflect the diversity of the country.

There are two flaws in this argument: first, empirically the workforce is less diverse than is often claimed; second, it ignores the social and economic factors that produce ‘meritorious’ candidates in the first place. Of course, it is not the IT industry alone that tends to exclude lower caste and rural candidates, nor is this done deliberately; rather, this is a problem with private sector employment in general, which is why the question of reservations in the private sector is being sharply debated. Although the IT industry maintains that it must be free to hire the ‘best’ or most meritorious people in order to maintain its
competitive edge and continue to provide increasing employment opportunities, recent public statements by industry leaders suggest that they are sensitive about this issue and wish to be seen as taking steps to increase the diversity and inclusiveness of their workforces. Several companies have floated internship schemes and training programmes for rural youth, but the primary thrust of the industry has been to target the primary education system through charitable foundations and partnership programmes with the government. They contend that they are not to blame for an education system that does not produce ‘employable’ people, and that primary education as well as higher and technical education must be improved drastically if India is to produce sufficient employable workers for the rapidly growing IT industry (including the introduction of English from Standard I or II).

The major objection of participants from the IT industry who attended the Dissemination Workshop to discuss the Draft Report was on the issue of homogeneity and diversity of the workforce. They argued that, given the shortage of manpower, the IT industry is recruiting ‘from every corner of India’ and rapidly extending its base by moving into second tier and smaller towns. This argument is substantiated by our own study, which found that a substantial proportion of employees are from small towns. However, this does not necessarily mean that the workforce is ‘diverse’ in terms of caste/class background. It is well known that the middle class in India is primarily higher caste in composition, and that there has been a process of social homogenization of the middle class across urban India, including in the smaller towns, with the spread of educational opportunities. Recently Infosys announced that it is launching a programme to train SC/ST engineers, in response to a challenge given to industry by the Minister
for Social Justice to initiate voluntary action on this front. Apart from the question of exclusion and inclusion, the sharp disparities in the education system and the IT industry’s methods of recruitment together have created a system of stratification within the IT workforce. A software engineer’s position and career prospects in this system are largely determined by his or her educational background. At the top are the graduates from the IITs and other premier institutions, many of whom still go abroad for higher studies and end up working in the U.S., at least for a few years. Those who stay in India or come back from abroad are able to land the best jobs in the MNC ODCs, in research, design or higher management positions. The next layer consists of those from the ‘Tier Two’ colleges, who are heavily recruited by the MNCs and the large Indian companies, followed by those from the ordinary private and government engineering colleges. At the lowest end are those with degrees from the ordinary engineering colleges or diplomas from private computer training institutes. However, even within the large companies there are different kinds of jobs, and they do hire people with MCAs for testing or even coding jobs, whereas for design they would look for rank holders from the best institutions. As noted above, the large majority of engineering graduates, computer science graduates, and those from computer training institutes are not recruited at all, at least by the major IT companies. Those from less reputed colleges and computer training institutes, who do manage to enter the workforce, do so after undergoing a prolonged period of private training and multiple certification courses and programmes. This stratification system is reinforced by the preferences of both employees and companies.

30 Source: Times of India, Bangalore, June 22, 2006.
MNCs are able to hire the best students from the top institutes because they offer better salaries, are considered to offer more challenging work, and are associated with higher prestige. The large Indian services companies, on the other hand, although they also attempt to recruit from the IITs and other top institutions, prefer to hire from second and third tier campuses. The HR manager of one of the largest services companies said that even when they hire people from the IITs, they do not do well in the exit exam that is held after the training programme for fresh recruits, because “they don’t fit the profile” (i.e., of the kind of employee that would fit into the company). He said: “We need people who are dedicated and meticulous; their [IIT ions’] outlook is different.” In contrast to IIT graduates who seek challenging work and are not submissive to authority, “Fuller and Narasimhan (2006) make the same argument with regard to IT employment in Chennai. Their study found that IT companies follow recruitment practices that tend to select only the best students from a few engineering colleges, because the majority of engineering graduates lack the required cultural capital, especially ‘communication skills’. They point out that the gap is not so much in their knowledge of English as in the unfamiliar cultural style of interaction and communication required by software companies a style that those from urban, middle class and higher caste families are more likely to have or be able to acquire. Their main argument is not that the retention or abolition of reservations in private engineering colleges is unlikely to diminish the advantages that the middle class enjoy with regard to employment in the IT sector, nor will it expand opportunities for those from lower caste, rural and less well-off backgrounds.”

“guys who can just sit and code and not ask questions”. He added that they prefer candidates from Category C colleges who know English and “can work and learn, rather than those from the top colleges”, because those from A and B categories will leave in a couple years. “So we plan accordingly, in order to get the types we want from different colleges.” This narrative makes it clear that there is a filtering mechanism in place that not only excludes certain social types from the IT industry (however unintentionally), but also (re)produces a social hierarchy within it. Inadequate training and a certain social background appear to create a docile and submissive workforce, and hence can become an advantage for companies. Given the nature of the education system and the easier access that students from middle class/ high caste backgrounds have to the IITs and the better engineering colleges, this means that the higher management positions and more challenging technical jobs within the IT industry are likely to be monopolized by people from more privileged social backgrounds, while greater ‘diversity’ may be found at the lower end of the job market.