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Working Party on the Information Economy

THE INFORMATION AND COMMUNICATION TECHNOLOGY SECTOR IN INDIA: PERFORMANCE, GROWTH AND KEY CHALLENGES

Paris, 11-13 March 2009

This paper has been prepared as part of work on analysis related to enhanced engagement countries. It follows on from the previous analysis of China (see the Information Technology Outlook 2006). It has been prepared in conjunction with Mita Bhattacharya, Monash University, Australia.

Note that the paper has been revised to take into account possible impacts of the current OECD area recession on the Indian ICT sector and global services supply, but mainly reviews long-term trends in development of the sector.

The paper is circulated for declassification.

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THE INFORMATION AND COMMUNICATION TECHNOLOGY SECTOR IN INDIA: PERFORMANCE, GROWTH AND KEY CHALLENGES

1. SUMMARY

1. The Indian economy has grown at a rate of 7.5%-8% per annum in recent years and is forecast to grow by 7-8% in 2009-2010.[1] Acceleration of economic growth has resulted in reducing poverty both at state and national levels. Impressive growth of the economy has created opportunities both in exporting software and services and also in the domestic market. Growth in Indian information Technology (IT) in the world market is primarily dominated by IT software and services including system integration, IT consulting, application management, customs applications development and maintenance (CADM), infrastructure management services, software testing and web-development. Competitive factors such as skilled workers, adequate telecommunication networks, and the policy and regulatory environment have enabled both domestic and foreign companies to expand in the IT sector. In previous OECD work the *Information Technology Outlook* (2000) included a chapter (Chapter 6) on the Indian IT industry looking at the software segment only between 1990 and 1997. A small section in Chapter 3 in the last OECD IT Outlook (2006) explored the Indian IT sector as a source of global outsourcing, increasingly competing with OECD countries in their home country as well as in abroad. There is however no recent detailed OECD analysis on the Indian IT sector. In this report, we provide an overview of the recent performance and growth of the Indian ICT sector with policies focussing both on the software and hardware segments. The report is set out as follows.

2. Section 2 contains a general introduction of the sector. Section 3 describes the general economic setting in India. In Section 4, the competitiveness of the Indian IT sector is described with respect to other countries. Section 5 analyses stages of development identifying various domestic segments and trade development for the sector. Section 6 describes revenue, employment and spending aspects of the sector. Section 7 identifies some driving factors behind the growth of the sector. Section 8 highlights some important policy changes and different initiatives have taken by the government and other bodies, including industry associations. The final section identifies some challenges which need to be addressed in maintaining the current growth and includes some discussion of the impacts of short and long-term effects on Indian IT on current economic downturn and the acute problems in the financial sector.

[1] See OECD (2008), *Economic Outlook, Number 84*, 25 November.

2. INTRODUCTION

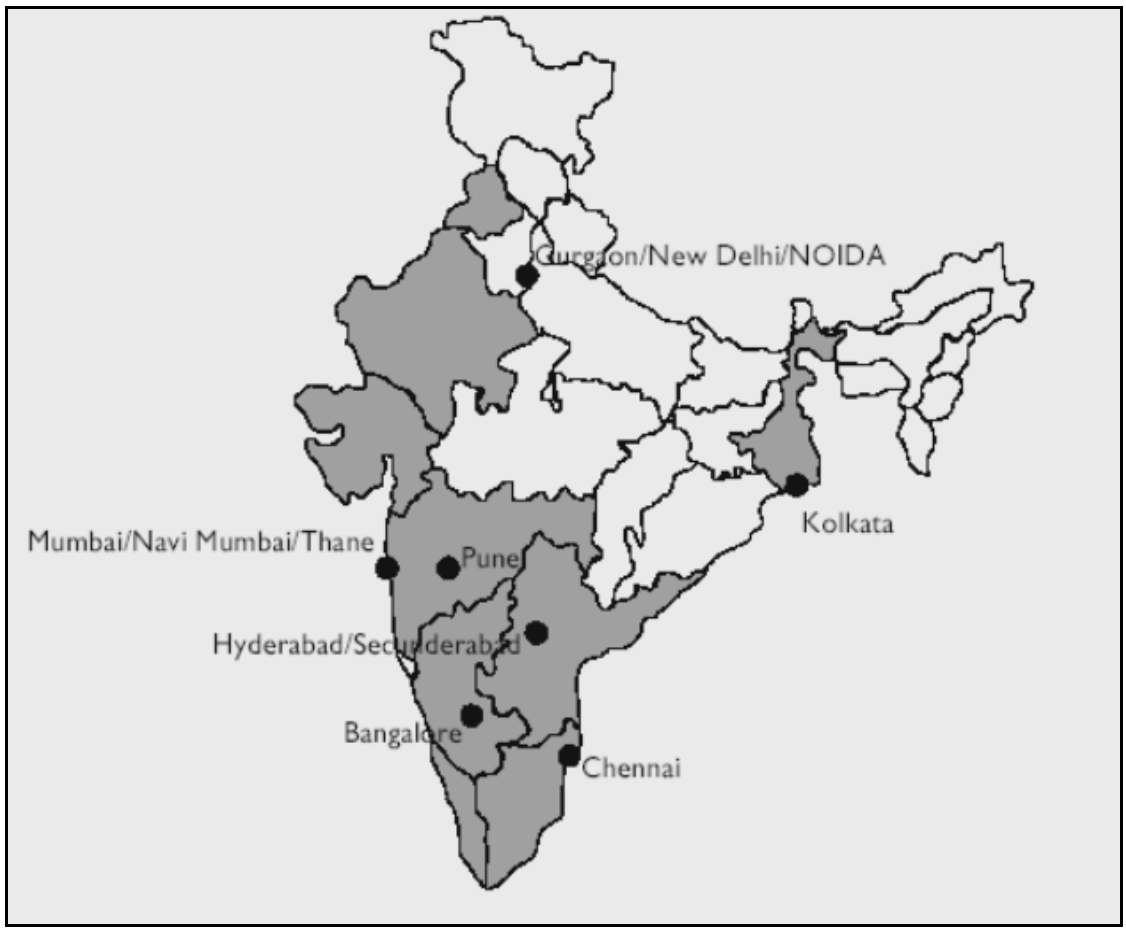
3. The rapid emergence of the information and communication technology (ICT hereafter) sector has placed India on the global stage during the last one and a half decades.[2] An explosion in the free flow of information and ideas has brought knowledge and its myriad applications to the global information society creating new choices and opportunities in the development process. The sector acts as a catalyst for growth across the economy, including commercial real estate, automobile, catering, hospitality, railway and mortgage banking industries. It is contributing to better governance and efficiency, and helping in changing the image of India abroad. In this study, the Indian IT sector is broadly categorised into IT services and software, Information Technology Enabled Services-Business Process Outsourcing (ITeS-BPO) and Hardware segments, with the presence of Indian IT companies across the globe along with multinationals in India. With USD 40 billion in revenues, the Indian IT sector grew 31% in 2006-07, whereas the global IT market grew 10% for the same period. Following a recent study by the NASSCOM-Deloitte (2008), contribution of IT/ITeS sector has increased to a share of 5.2% of GDP in 2007 against 1.2% in 1998.

4. In addressing the contribution of this sector in Indian economy at the NASSCOM India Leadership Summit 2007, the Nobel Laureate Professor Amartya Sen stated that "… [it] is not that the IT industry should do something for the country at large, for that it does anyway. It makes enormous contributions: it generates significant income for many Indians; it has encouraged attention to technical excellence as a general requirement across the board; it has established exacting standards of economic success in the country; it has encouraged many bright students to go technical rather than merely contemplative; and it has inspired Indian industrialists to face the world economy as a potentially big participant, not a tiny little bit- player. …, rather, is that it can do even more, indeed in some ways much more. This is because the reach of information is so wide and all-inclusive, but also because the prosperity and commanding stature of the IT leaders and activists give them voice, power and ability to help the direction of Indian economic and social development".

5. In India, the majority of IT / ITeS activities are concentrated in seven cities/clusters. Bangalore has been saturated owing to the limits of infrastructure (transport and utilities, especially electricity -- a common problem throughout India) and the scarcity of land. Hyderabad and Chennai have started to be seen as alternative locations in the south. The geographical spread of IT / ITeS activity is gradually expanding to cover cities such as Ahmedabad, Bhubhaneswar, Chandigarh, Coimbatore, Jaipur, Kochi, Madurai, Mangalore, Mysore and Trivandrum. The major clusters are depicted in Figure 1.

[2] The terms ICT and IT sector will be used interchangeably.

Figure 1. Clusters of ICT in India



Source: Report on 'ICT Industry in India', the Indo-Italian Chamber of Commerce and Industry, November 2006.

3. GENERAL ECONOMIC SETTING

6. The Indian economy has undergone significant changes in economic management. Economic liberalisation since 1991 has impacted most aspects of economic policy including industrial and financial segments in domestic markets and in trade and foreign investment. Annual growth in GDP per capita has increased from 1.25% in the three decades after independence to 7.25% in 2007 and is forecast to grow at approximately the same rate in 2008-2010.[3] In a recent speech, Indian Prime Minister Dr Manmohan Singh emphasised that the fundamentals of the Indian economy are still believed to be strong in recent crisis and it is expected to have 7-7.5% growth in 2009.[4] GDP per capita was USD 812 in 2006/07 (see OECD, 2007). The average share of exports and imports in GDP has increased from 6% in 1985 to 24% in 2006. Rapid growth in exports of merchandise and IT-related services has contributed to the increase in the export share of GDP. Employment in general has increased significantly; however net increase occurring almost exclusively in the informal sector. Employment in the organised (formal) sector has been shrinking (OECD, 2007). This is due to the high labour costs (in form of compensation) inducing larger firms to substitute more capital for labour.[5] Levels of income have been growing faster than middle income countries amongst non-OECD countries**.** However constraints remain in terms of infrastructure and utilities, particularly transport and electricity (OECD, 2007).

3 See OECD (2008), *Economic Outlook, Number 84*, 25 November.

4 Economic Times November 9, 2008; IMF's projection is 7.8% for 2008 and 6.3% for 2009.

5 See OECD 2007, Chapter 4, p125.

4. COMPETITIVENESS OF THE INDIAN ECONOMY AMONGST THE BRICS AND OTHER NATIONS

4.1. Rankings in Measuring Competitiveness

7. India and China have been developing into major global players. The changing global business landscape is the major demand driver, forcing multinational companies to expand particularly in these two countries.

8. Amongst recent rankings by various international organisations, Global Competitiveness Report, 2007 at the World Economic Forum, ranked India as 48th amongst 131 countries. Positions of China, Russia and Brazil were 34th, 58th, and 77th respectively, reflecting overall business competitiveness.[6] The IMD World Competitiveness Yearbook 2007 and 2008 provide several customized rankings by size, wealth regions, etc. The 'Overall Competitiveness Scoreboard' is calculated by combining four factors of competitiveness viz. Economic Performance, Government Efficiency, Business Efficiency and Infrastructure. India ranked 29 out of 55 countries, while China's position was 17 in 2008 as presented in Table 2, China's rank has improved slightly, while India lost 2 points out of 55.

Table 1. IMD World Competitiveness Scoreboard, 2007-2008

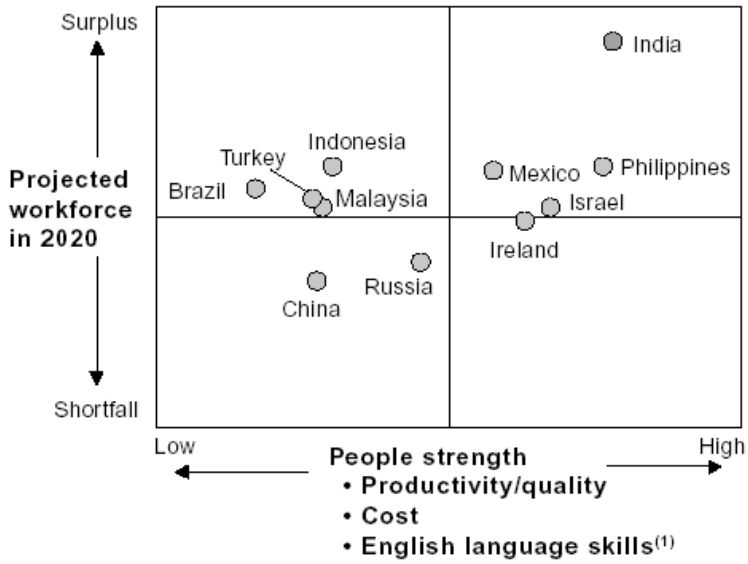
Score 2008	Country	Rank 2007 (Total 55 countries)	Rank 2008 (Total 55 countries)
100.0	USA	1	1
99.33	Singapore	2	2
94.96	Hong Kong, China	3	3
84.40	Luxemburg	4	5
83.85	Denmark	5	6
89.65	Switzerland	6	4
80.47	Netherlands	8	10
82.46	Sweden	9	9
73.75	China	15	17
60.62	India	27	29
66.01	France	28	25
45.73	Russia	43	47
48.57	Brazil	49	43

Source: IMD World Competitiveness Year Book, 2007 and 2008

9. As shown in Figure 2, India has the largest pool of manpower as well as the highest quality of people. The competitive advantage in skilled, low cost, highly productive workers is reflected in a projection for 2020. Based on this figure, India is far ahead compared to other countries like Mexico, Philippines, Israel, Ireland and Brazil in supplying a quality labour force. In recent years, the emergence of these alternative locations and maintaining the supply of quality human capital to meet increasing demand seemed to be the key challenges in maintaining the competitiveness of this sector.

6 Source: www.weforum.org/en/

Figure 2. India's Competitive Advantage vis-à-vis other Nations



(1) Over 50% of shortages expected from English-speaking countries
Note: Pakistan, Bangladesh and Vietnam have not been represented for lack of reliable data on productivity and cost of service employees
Source: World Competitiveness Yearbook 2001; Britannica Yearbook; Literature search; BCG analysis

10. India ranked 44th out of 122 countries in the networked readiness index of 2006-07, and China's position was 59th based on the Global Information Technology Report (2006-07). Other driving factors for India are cost effectiveness, quality assurance, supply of technical graduates, availability of high quality telecommunication infrastructure and a favourable time zone relative to the U.S. and Europe. While multinational giants like IBM, Accenture, Electronic Data Systems, and Deloitte are rapidly expanding in India using its low-cost, high quality labour force, Indian firms, providing high-end consulting services, are growing in the US and Europe. These reports on competitiveness from various organisations, demonstrate India's comparative advantage in various areas and its importance in the world market.

5. GROWTH OF THE INDUSTRY

5.1. Stages of Development

11. The government of India has played a significant role in initiating software export policies since the late 1960s.[7] A number of studies have reviewed different aspects of software exports (Schwere 1987, 1992; Sen 1995; Heeks 1996; OECD IT Outlook 2000, Kumar and Joseph 2005 and Mathur 2007a, b). Various policies during the 1970s and 1980s protected domestic hardware and restricted competitiveness thus preventing the growth of value-addition in the industry.[8] In 1986, the government announced a new policy to develop a strong software sector. This was followed in 1988 with the World Market Policy and the establishment of the Software Technology Park from India (STPI) scheme. The National Taskforce on Information Technology and Software Development (NTITSD) was established in 1998 to formulate long-term plans and remove impediments to the growth of the IT sector. In early 2000, the formation of the Ministry of Information Technology was another step in promoting these initiatives. A Task Force on Human Resource Development was established to formulate long-term strategies to increase the number of well-trained IT professionals. Upgrades to the Education and Research Network (ERNET) connecting various universities and regional engineering colleges (RECs) through a high speed network, lowering customs duties on IT products, allowing 100% foreign investment and passing the Information Technology Act, 2000, are other recent initiatives in the sector.

5.2. The Growth Path

12. The Indian IT sector has grown at a remarkable rate over the last decade. The growth is predominantly in IT services, but the hardware and related components market has also grown in recent years. Figure 3 presents the performance of the industry considering both domestic and export markets in the last ten years. In 2006-07, total revenue was USD47 billion; the industry employed 1.63 million persons and contributed 5.4% of GDP.[9] The NASSCOM-Crisil report titled 'The Rising Tide –Output and Employment Linkages of IT-ITeS' suggests: 'Every rupee spent by the IT-ITeS sector (on domestically sourced goods and services) translates into a total output of Rs 2 in the economy. Also for every job that is created in this sector, four jobs are created in the rest of the economy.'[10] We first focus on the software, services and Business Process Outsourcing segment, followed by a discussion of the hardware and electronics segments for both domestic and external sectors in analyzing growth in recent years.

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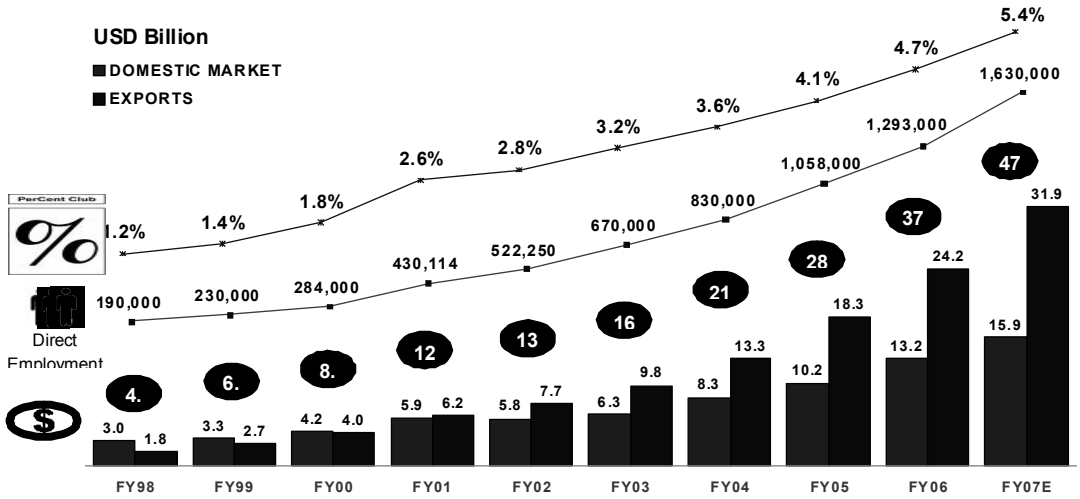
7 The first electronic computer arrived in India in 1955, origin of a computer policy dates back to August 1963 when the committee on electronics was introduced. Refer Heeks 1996.

8 Import tariffs were high (135% on hardware and 100% on software). See Dossani (2006).

9 The Indian financial year runs from April to March. For example, the 2006-07 financial year starts on April 30, 2006 and ends on March 31, 2007.

10 Source: Indian Brand Equity Foundation (IBEF), accessed on September 29, 2007.

Figure 3. Industry Performance over the Last Ten Years



Source: NASSCOM, IT Industry Factsheet, August 2007

5.3. Domestic Demand

13. The domestic market in IT has started to emerge from the shadows of the export segment. The overall size of domestic demand, comprising hardware, software and services (IT-BPO), grew by 29% in 2005-06, and was at USD 15.9 billion in 2006-07. Spending on software and services (IT-BPO) was greater than total spending on hardware, for the first time in 2005-06 and is expected to continue increasing its share in 2006-07.[11] Banking, financial, services and insurance (BFSI), manufacturing, railways, telecom, and government are the key vertical markets driving growth in domestic IT spending across categories which include hardware systems, networking, storage, security, enterprise application products and related services. BFSI, telecom and consumer durables are the early adopters of the BPO services within the domestic market and currently account for about three-quarters of the business in this space. However, education, retail and healthcare are some of the emerging areas that have started contributing to growth in this sector. Call centres, insurance claims processing, legal databases, digital content development, online education, medical transcription, data digitization, payroll/HR services and web services are other kind of products where India has started specializing in the world market.

5.3.1. Software and Services

14. In the early years, software companies were mostly software solution providers. Manufacturing of packaged products with high value-added along with sustained improvement in quality, investing in manpower and competitive R&D environment has helped them gradually move up the value chain both in the domestic and export sectors. In 2006, hardware-led growth in the domestic sector was subdued and the increasing share of software and services in this area is expected to continue. Domestic demand has shifted from hardware towards a solutions orientated approach, with a growing emphasis on services.

5.3.2. Business Process Outsourcing (BPO)

15. BPO has emerged as an effective means of engaging specialists with the task of consistently delivering the desired high levels of quality, while the client organizations focus on their core businesses. The demand for BPO has witnessed noticeable growth in the domestic sector over the past few years. Increasing competition and growing emphasis on customer satisfaction is also driving public sector

[11] This section is heavily drawn from NASSCOM, Indian IT Industry Factsheet (2006).

organizations towards BPO. For example, Air India outsourced its domestic customer service operations to third-party providers and Indian Railways announced its plans to establish Railway Enquiry Franchisees across the country. The success of these early initiatives by the public sector is of critical importance to the domestic BPO sector. An increasing number of Indian brands such as Infovision, HTMT Global Solutions and Bharti Airtel are investing in quality customer care and gradually adopting global best practices to capture the booming market.

5.3.3. Hardware and Consumer Electronics

16. The Indian hardware segment mostly caters for the domestic market. Hardware accounted for about 49% of the total domestic IT-BPO spending in 2006. Revenue in the domestic sector grew at approximately 17% in 2006. Personal computers, notebooks, and servers have continued to lead hardware spending in 2006. In the hardware segment, many multinationals are establishing plant in India. In this respect, India has started competing with China, a manufacturing hub for many multinationals based on an original equipment manufacturers (OEMs) supply model. Also various initiatives have been formulated in promoting a stable investment climate and in removing bureaucratic delays in hardware exports in current five-year plan.

- **Computers and Peripherals**

  The size of the computers and peripherals segment in India in 2005-06 (including printers, uninterrupted power supply (UPS) and networking products) was approximately USD 5 billion. The consumption of computers was 5.13 million units with a growth of 32% between 2004-05 and 2005-06. Desktops accounted for 4.6 million units growing 28%, while notebooks accounted for 0.5 million units growing 144%. In value terms, the computers and notebooks sales consisted of USD 2.5 billion resulting in a growth of 28% over 2004-05, the growth in desktops being 18% and in notebooks 107%. Desktops sales have increased 8% in 2006-07 compared to 2005-06, while notebook sales are growing at a pace of 180% over the same period.[12]

  Of the total desktops segment in the country, almost 85% are assembled locally. All leading global brands including HP, Lenovo and ACER, have assembly units in India. In 2006, Dell initiated its assembly unit in Tamil Nadu. Multinational brands account for 65% of the PC market in India. Indian PC brands such as HCL, Zenith, Wipro and PCS account for 35% of the market. Some major companies in this segment are HCL Infosystems, Aceel Frontline, Acer Indian (Pvt), Apple Computer International (Pvt), CCS Infotech, D-Link India, Team Engineers, Ingram MicroIndia, VXL Instruments and WeP Peripherals.

- **Consumer Electronics**

  Currently India imports almost 60% of its electronics goods. Consumer Electronics (CE) is the largest segment of the electronics sector. The consumer electronics boom recently raised India's emerging electronic manufacturing services (EMS) industry. It contributes 33% to the electronics production in the country. The premium consumer electronics market is dominated by Sony, Samsung and LG Electronics with a strong presence of imported products. The top five mobile handset companies-Nokia, Motorola, Samsung, Sony-Ericsson and LG have started manufacturing in India. Recent performance of some of the major products is described below.

  Colour TV (CTV) This segment is the main driver of the CE Sector in the Indian market. It has registered reasonable growth mainly due to the explosion of cable TV channels. CTV production has grown to 10.50 million in 2006 from 5.2 million in 2002. The total TV market including B&W has remained stagnant at around 10 million during the tenth plan period (viz., 2002-07).

[12] www.ibef.org/, source Economic Times, February 1, 2007.

Penetration level in rural areas is still low providing immense scope for expansion in the domestic market. The tax rate is very high on consumer electronic products. Major TV makers LG, Samsung, Akai, BPL, Onida, Videocon. Bigesto (clients include LG, Onida, Akai, BPL and Videocon) produce 1 million TVs every year.

Audios This ***se***gment consists of stand-alone radio sets, combinations of radios with cassette players and CD/DVD players. Total production of stand-alone radios is estimated to be around 6.0 million of which organized sectors contribute about 2.5 million.[13]

Car Audios This segment consists of Cassette players, FM radios, and Cassette/CD/DVD players in combination with radios. Estimated demand is around 2 million items. This includes 0.5 million stand-alone FM radios for automobiles, mostly 3 wheelers. Of the remaining 1.5 million items, domestic production accounts for about 1.0 million. Only 20% of this production is contributed by the organized sector.

DVD Players This segment of the industry has had exponential growth in the last 2-3 years. The growth has been due to crashes in the price of hardware and the easy availability of cheap pirated software. The price of DVD Players of any reputable brand has dropped from Rs.25,000 in 2002 to Rs.3,500 in 2006. The market for DVD players has increased from 50,000 items to about 4,000,000 items in this period. LG electronics is investing in a new DVD facility in Pune which will serve both domestic and export markets.[14]

- **Semiconductors**

  India is becoming increasingly important for semiconductor production. In semiconductor sector-application, design and manufacturing are three major segments. In 2005, India Semiconductor Association (ISA) was formed in strengthening the semiconductor eco-system in India. The semiconductor market is expected to be worth USD5.5 billion by 2009 from USD2.7 billion in 2006, registering a 26.7% CAGR. Designing chips at lower costs is the main attraction for MNCs. India specialises in producing Very Large Scale Integration (VLSI) and System on Chips (SoC) integration. Nokia, Alcatel, Texas Instruments and NXP Semiconductors and Videocon are among 130 firms in India have been engaged in chip design. Sony, Matsushita Electric, Sharp, Fujitsu, Toshiba and Sanyo amongst others set up their software development centres in India. Bangalore, Hyderabad, Delhi/Noida and Chennai are major centres comparable with global clusters at Silicon Valley, Cambridge (in the UK) and Chinese Taipei.[15] The semiconductor industry has received priority in Eleventh Five Year Plan. SemIndia, a consortium of companies from the US and June Min, a Korean entrepreneur, have recently announced plans to build a plant in Hyderabad.

5.4. External Market: Different Segments

17. Indian companies have become important competitors in world markets, and Indian businesses have started to face increasing levels of global competition. This has forced them to deliver world class products and quality services. In 2007, the IT-BPO segment was growing at an estimated 28%. This includes both domestic and export sectors. Total aggregate revenue for the sector is estimated to exceed USD 47.8 billion, a near ten-fold increase over the aggregate revenue of USD 4.8 billion reported in

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13 India has grey market with illegal/refurbished/counterfeit products.

14 Statistics for consumer electronics are sourced from the document on Eleventh Five Year Plan, 2007-12, Department of IT, Ministry of Communications and Information Technology, Govt of India.

15 Information on semiconductors is sourced from a report by Evalueserve titled ‘Semiconductors: Market and Opportunities’.

1998.[16] Despite the strong rupee and increasing labor costs, Indian IT exports have performed significantly well in 2006-07, contributed a share of 16.63% in India's overall exports during this period. The government expects turnover to reach USD 80 billion by 2011, with an annual growth of 30% per annum.

5.4.1. Exports of Software and Services

18. During 2006-07, electronics and IT exports are estimated to be around (USD 34 billion approximately, as compared to around USD 25 billion in 2005-06, showing a significant growth of about 35%.[17] Within exports, IT services reached USD18 billion, a growth of 35.5%. Tata Consulting Services (TCS), Infosys and Wipro maintained their ranking as the top three exporters within the NASSCOM's Top 20 IT software and services exporter rankings. Among these Top 20, only 6 are Multinational Enterprise (MNE) affiliates. TCS has launched packaged software for the banking, insurance, securities, accounting and health care industries. Mastercraft, an integrated set of software tools launched by TCS has been well received in the US and Europe. Banking software from Infosys (Bankaway, Financle and Payaway) has been adopted by 22 domestic and 16 overseas banks in 12 countries. Wipro Technologies has recently introduced Teleprodigy, a billing system for ISPs and WebSecure, an Internet security package. Many smaller, highly specialised Indian companies are developing software widely used in banking, financial and accounting sectors in the US, UK and European countries.

19. While the US and UK remain the dominant markets for IT-ITeS exports with a share of 67% and 25% respectively in 2006, revenue from other markets is also growing. Leading multinational companies have operations in India, accounting for 16% of their delivery capabilities in offshore locations.[18]

5.4.2. Exports of Business Process Outsourcing (BPO)

20. In the last decade, India has been the leading source for offshore service supply, and now accounts for 65% of the global industry in offshore IT and 46% of the global BPO industry. Growth of exports in BPO was about 32% in 2006-07 and is estimated to contribute USD8.3 billion in 2007. The U.K. remains the major market within the EU, contributing finance and accounting (F&A) services, customer interaction services, human resource administration (HRA) and a wide range of other vertical-specific and niche services. The Indian BPO companies include 3iInfoTech, Mindtree Consulting, NIIT SmartServe, Perot Systems, Hewitt Associates, and Infinite Computer Solutions among others. Followed by BPO services, Knowledge Processing Operations (KPO) is currently becoming significant market. MNCs are setting up third party captive units of data analysis, data modeling. India's share in global KPO revenues is estimated to be 60-70%, and estimated to grow to USD 12 billion for 2009-10.[19]

5.4.3. Exports of Hardware and Consumer Electronics

21. India is gradually building a hardware manufacturing base but the electronic hardware industry in India is still orientated towards the domestic market. The market is fragmented, lack of component base and infrastructural barriers with high cost of finance and high technological obsolescence. The electronics hardware industry is very much import-dependent. Given that consumption will increase every year, the trade deficit is set to accelerate in future.

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16 NASSCOM, ITeS-BPO Fact sheet, August, 2007.

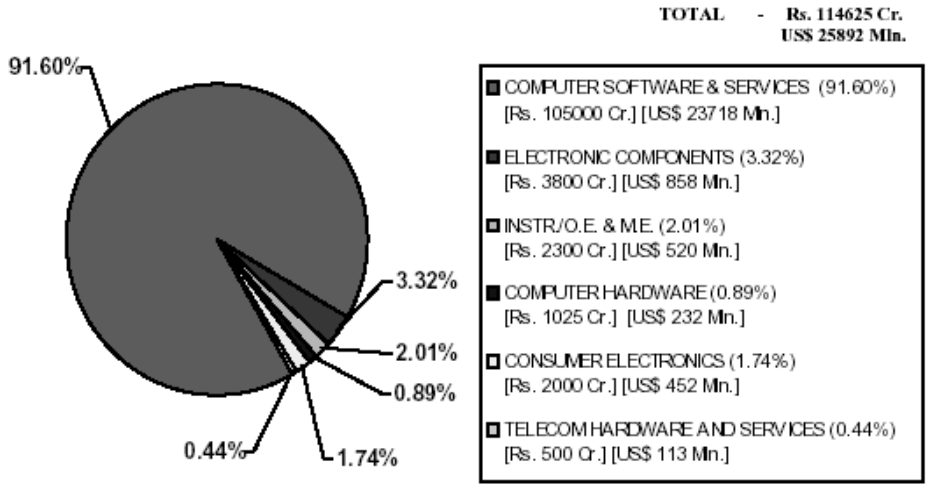
17 1 US Dollar was approximately 44.9 Indian Rupees (INR) in 2005-06.

18 Source: NASSCOM quoted by the IBEF, accessed on September 29, 2007

19 NASSCOM (2007-08, Annual Report).

22. In 2006-07, the exports of electronics hardware increased 30% compared to 2005-06. Celetronix, Hewlett Packard India, Samsung, VXL Instrument, Bacro Electronic, L.G. Electronics, Zenith Computers, and WEP Peripherals are amongst the top exporters. North America is top with about 27% of total exports; EU is second with just above 25%, followed by South Asian countries at around 21%.[20] With a very high growth of 118% (121% in USD), uninterrupted power supply (UPS) has emerged to be the top export item. Colour television, which was in fifth position in 2004-05 registered high growth of 101% (104% in USD terms) moving to fourth position during 2005-06. The other major items of export during the year 2005-06 were CD-Recordables, Memory cards, Picture tubes, DVDs, Medical Instruments, Connectors and Clocks / Watches.[21] Figure 4 represents sector contributions to exports from electronic hardware and computer software and services for 2005-06. Computer software and services contributed 91.6 % of total exports of this sector; the other 8.4% is from the electronics and hardware segment. This figure represents a wider scope of expanding Indian hardware and electronics companies in world markets.

Figure 4. Sector Contribution in Exports of Electronic Hardware, Computer Software and Services: 2005-2006



Source: Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

23. Table 2 presents production and export figures for electronics and software products between 2000-01 and 20005-06. Export out of total production has increased from 47.48% to 63.45% between 2000-01 and 2006-07.[22]

[20] IBEF, 'Electronics hardware exports up 30%', The Economic Times, Accessed on September 29, 2007

[21] Source: Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

[22] 2006-07 is from Statistical Year Book 2006-07, Electronics and Computer Software Export Promotion Council, Govt. of India.

Table 2. Electronics and Computer Software Production and Exports: 2000-2001 to 2005-2006 (USD million)

SECTOR	2000-2001	2001-2002	2002-2003.	2003-2004		2004-05	2005-2006
CONSUMER ELECTRONICS							
PRODUCTION	2597.83	2662.47	2851.24	3304.35		3741.65	4178.90
EXPORT	134.78	146.75	154.96	179.35		256.12	451.77
COMM. & BROADCASTING EQUIP.							
PRODUCTION	978.26	943.40	991.74	1163.04		1024.50	1219.79
EXPORT	126.09	31.45	103.31	35.87		77.95	112.94
INSTRUMENTATION & STRATEGIC EC.							
PRODUCTION	1250.00	1320.75	1663.22	1923.91		2394.21	2823.58
EXPORT	121.74	199.16	289.26	329.35		334.08	519.54
ELECTRONIC COMPONENTS							
PRODUCTION	1195.65	1194.97	1363.64	1652.17		1959.91	2055.57
EXPORT	397.39	461.22	495.87	816.30		846.33	858.37
COMPUTER HARDWARE							
PRODUCTION	739.13	744.23	878.10	1478.26		1959.91	2371.81
EXPORT	260.87	377.36	113.64	313.04		267.26	231.53
TOTAL (A)							
PRODUCTION	6760.87	6865.83	7747.93	9521.74	43800.00	11080.18	12649.65
EXPORT	1040.87	1215.93	1157.02	1673.91	7700.00	1781.74	2174.16
EXPORT Vs PRODUCTION	15.40	17.71	14.93	16.08	17.19		
B. COMPUTER SOFTWARE							
PRODUCTION	8021.74	9931.66	12376.03	16141.30	74250.00	21587.97	29695.05
EXPORT	5978.26	7651.99	9607.44	12608.70	58000.00	17216.04	23718.09
EXPORT Vs PRODUCTION	74.53	77.05	77.63	79.75	79.87		
TOTAL (A+B)							
PRODUCTION	14782.61	16797.48	20123.97	25663.04		32668.15	42344.70
EXPORT	7019.13	8867.92	10764.46	14282.61		18997.77	25892.25
EXPORT Vs PRODUCTION	47.48	52.79	53.49	58.15	61.15		
Average Exchange Rate 1USD =	46.00	47.70	48.40	44.90	44.27		

NOTE: Production figures of Electronic Hardware Panels Source: Published figures of MIT in their annual report.

Source: Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

5.4.4. Import of Electrical Machinery: Source Countries

24. Table 3 depicts the top five sources of Indian imports for Electrical Machinery over the period 2002 to 2007. During this period China's share has increased from 10.05% to 27.8% of total import demand for electrical machinery products. Demand for these imports increased 44% per annum over this period. Telecom, computer and electronic components are the most important imported items followed by audio and video components.

Table 3. Top 5 Importers and World Supply of Imports for Electrical Machinery to India: 2002-2007 (USD million)

Countries	2002	Countries	2004	Countries	2007
USA	87.33	USA	118.26	China	544.62
Japan	66.02	China	101.5	Germany	212.38
Germany	61.32	Germany	95.43	USA	177.34
China	59.95	Korea	84.61	Japan	110.59
Korea	56.83	Japan	81.04	Korea	100.38
World	596.15	World	872.82	World	1954.35

Source: Centre for Monitoring Indian Economy (CMIE Database)

5.4.5. Destinations of Exports

25. Indian IT exports are predominantly based on services. In recent years electronics goods exports have increased. Table 4 provides a breakdown of electronic hardware and computer software & services exports to the major destination countries for 2005-06. The US and European countries together registered nearly 52% of electronic hardware and around 85% of computer software exports. Exports to North America during this period are estimated to be USD 15,334 million, up from USD 11546 million in 2004-05 registering a growth of 33% in USD. Exports to EU countries grew by 42% in USD terms during the same period. In value terms, exports of Electronics and Computer Software / Services to EU Countries increased from an estimated USD 4671 million in 2004-05 to USD 6627 million in 2005-06. Singapore, Hong Kong, China and other South Asian countries attracted around 23 % of total electronics exports for the same period. In recent times, besides traditional exporting countries, Indian companies are extending into the Middle-East, North Africa and Latin American countries.

Table 4. Major Destinations for Electronic Hardware and Computer Software and Services Exports during 2005-06

Value: Rs.Cr
(USD Mn.)

Destination	Electronic Hardware		Computer Software		Total	
	Value	% of Sector Total	Value	% of Sector Total	Value*	% of Sector Total
NORTH AMERICA	2682.61	27.87	65200.00	62.10	67882.61	59.22
	(605.97)		(14727.81)		(15333.77)	
EUROPE (EU)	2339.44	24.31	27000.00	25.71	29339.44	25.60
	(528.45)		(6098.94)		(6627.39)	
SINGAPORE,HONGKONG & OTHER SOUTH ASIA	2199.87	22.86	2800.00	2.67	4999.87	4.36
	(496.92)		(632.48)		(1129.40)	
JAPAN,KOREA & OTHER FAR EAST	550.31	5.72	3200.00	3.05	3750.31	3.27
	(124.31)		(722.84)		(847.14)	
MIDDLE EAST	1083.43	11.26	2500.00	2.38	3583.43	3.13
	(244.73)		(564.72)		(809.45)	
EUROPE (NON EU)	52.98	0.55	2200.00	2.10	2252.98	1.97
	(11.97)		(496.95)		(508.92)	
AUSTRALIA & OTHER OCEANIA	87.05	0.90	1300.00	1.24	1387.05	1.21
	(19.66)		(293.65)		(313.32)	
AFRICA	370.20	3.85	425.00	0.40	795.20	0.69
	(83.62)		(96.00)		(179.63)	
LATIN AMERICA	144.12	1.50	350.00	0.33	494.12	0.43
	(32.55)		(79.06)		(111.62)	
RUSSIA & C.I.S.	115.00	1.19	25.00	0.02	140.00	0.12
	(25.98)		(5.65)		(31.62)	
TOTAL	9625.01	100.00	105000.00	100.00	114625.01	100.00
	(2174.16)		(23718.09)		(25892.25)	
Average Exchange Rate 1USD = Rupees 48.40	(44.27)					

*Excluding Telecom & Related Services Export of Rs. 3700 (USD 804 Mn.)

*Excluding Video Film Software Export of Rs. 1200 (USD 261 Mn.)

Source: Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

26. For electronics goods, as shown in Table 5, the USA remains the major export destination for India. Other top destinations are Singapore, Germany, Netherlands and the UAE for 2007. Export revenue from the world for Indian electronics goods has increased 132% over the last five year period (i.e., 2002-07).

Table 5. Top 5 Export Destinations of Electronics Goods from India: 2002-2007 (USD million)

Countries	2002	Countries	2004	Countries	2007
USA	240.78	USA	390.44	USA	730.79
Malaysia	178.41	Singapore	132.27	Singapore	262.14
Singapore	128.1	Netherlands	125.63	Germany	205.26
Netherlands	84.22	UAE	109.5	Netherlands	172.95
Hong Kong	56.98	Germany	108.42	UAE	151.3
World	1174.81	World	1729.5	World	2730.33

Source: Centre for Monitoring Indian Economy (CMIE)

27. Table 6 presents major exporting items. Computer Software/Services, ITeS/BPO, UPS and colour TV are popular for export market particularly in US and European countries. Middle East and other South-Asian countries are also popular destinations for these products.

Table 6. Top Exporting Items (both Software/Services and Hardware related) from the Indian ICT Sector and their Destination: 2004-05 to 2005-06.

Rank	Items	Export 2005-2006 USD Mn.	Export 2004-2005 USD Mn.	% Age Growth During 2005-2006 Over 2004-2005 USD Term	Major Destinations During 2005-2006 with Approximate % age Share of Items in Total Export Value
1	Computer Software / Services	16941.50	12026.73	40.87	USA (60.05), UK (18.83), NETHERLANDS (2.33), JAPAN (2.24), SINGAPORE (1.45), UAE (1.73), GERMANY (1.45), CANADA (2.04), OTHERS (9.88)
2	ITES/BPO	6776.60	5189.31	30.59	USA (70.00), UK (5.00), GERMANY (5.00), JAPAN (5.00), SINGAPORE (5.00), AUSTRALIA (5.00), CANADA (5.00)
3	Un-Interrupted Power (UPS)	284.51	128.49	121.43	USA (98.31), NETHERLANDS (1.47), UAE (0.04), SRILANKA (0.02), NEPAL (0.02), KENYA (0.01), UGANDA (0.01),LEBANON (0.01),OTHERS (0.07)
4	Color TVs	190.00	93.25	103.76	ITALY (45.65), UAE (27.54), TURKMENISTAN (6.10), KAZAKISTAN (3.74), SRILANKA (3.55), BELGIUM (2.76), BANGLADESH (1.98), RUSSIA (1.47), NEPAL (0.92), OTHERS (6.30)
5	C.D Recordable	188.53	155.92	20.91	GERMANY (29.63), USA (27.17), NETHERLANDS (21.38), LUXEMBOURG (7.01), UAE (3.60), ARGENTINA (1.93), LITHUANIA (1.67), URUGUAY (1.08), RUSSIA (0.74), BRAZIL (0.62), SOUTH AFRICA (0.61), SAUDI ARABIA (0.50), ECUADOR (0.49), AUSTRALIA (0.40), JAPAN (0.32), CHILE (0.27)
6	Memory Card	153.13	83.01	84.46	USA (85.00), UK (5.76), SINGAPORE (3.55), UAE (2.05), HONGKONG (1.12), SRILANKA (1.09), BELGIUM (0.52), SWITZERLAND (0.22), FRANCE (0.20), SOUTH AFRICA (0.16), AUSTRALIA (0.13), GERMANY (0.07), CANADA (0.04), CHINA (0.04), BRAZIL (0.03), CHINESE TAIPEI (0.02)
7	Picture Tubes	135.66	108.78	24.71	USA (13.99), SINGAPORE (13.11), CHINA (12.38), JAPAN (12.36), FRANCE (12.34), TURKEY (8.43), RUSSIA (7.68), BANGLADESH (7.26), SPAIN (7.20), EGYPT (1.55), UK (1.11), GERMANY (0.93), NETHERLANDS (0.45), ITALY (0.34), ROMANIA (0.22), CROATIA (0.15), THAILAND (0.15), BELARUS

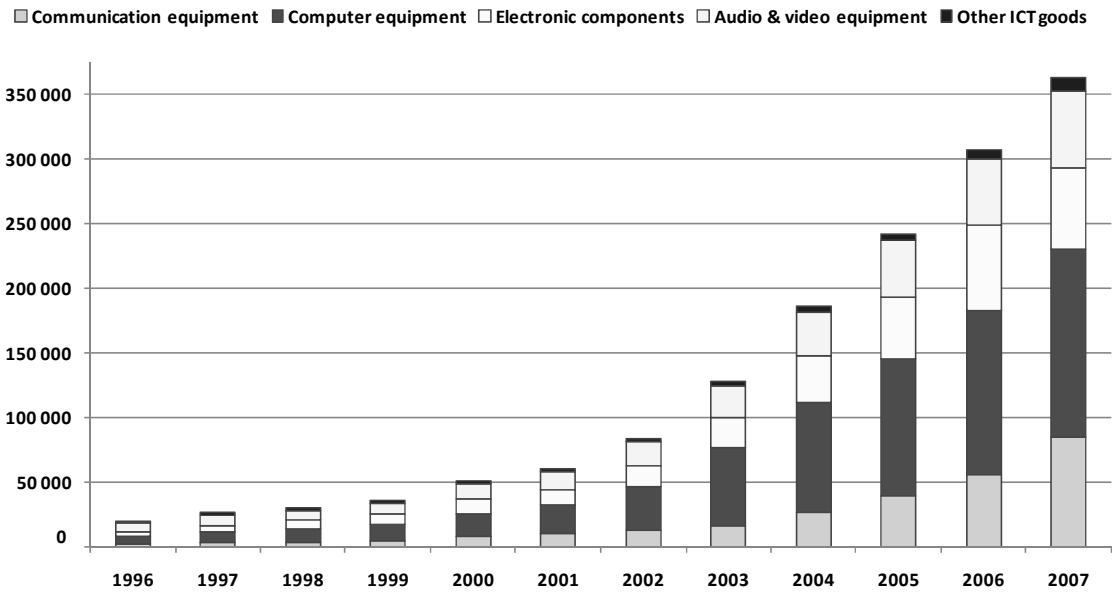
Source: Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

5.4.6. Trade Developments: Trade Comparison with other Countries

28. In global market, India has several competitors both in hardware, software and services segments. Figure 5 presents the exports of ICT goods from the emerging BRICs countries. The total ICT exports from BRICS countries have increased twenty fold between 1996 and 2007.

Figure 5. ICT Goods Exports from the Emerging BRICS Economies, 1996-2007

(USD millions in current prices)



Notes: Data are incomplete, with no data for Brazil, the Russian Federation and South Africa in 1996.

Source: OECD, based on data from the joint OECD-UNSD ITCS database.

29. Table 7 presents a further breakdown of trade in ICT goods for BRICs countries over the period 1996 to 2007. Communication equipment, computer equipment, electronic components, audio and video equipment and other ICT goods are considered under goods. Except China, Brazil, Russia and India were the net importers of these goods. China had trade surpluses since 2002 and registered a surplus of USD72, 516 in 2006. The Indian trade deficit for ICT goods has increased more than tenfold between 1996 and 2004, - from USD709 to USD7835, as the rate of increase is much faster in the import sector compared to exports in the case of India.

Table 7. Emerging Economies Trade in ICT Goods, 1997-2007

(USD millions, current prices)

	1997	1999	2001	2003	2005	2007
BRAZIL						
Exports						
Communication equipment	214	402	1 337	1 349	2 844	2 332
Computer equipment	257	330	290	227	373	229
Electronic components	174	218	416	352	358	245
Audio & video equipment	400	334	375	240	176	178
Other ICT goods	131	194	222	164	287	397
Total ICT exports	1 176	1 479	2 640	2 332	4 038	3 380
Imports						
Communication equipment	2027	1588	2193	599	1150	3187
Computer equipment	1516	1424	1639	1188	1854	2457
Electronic components	2748	2876	3273	3077	5446	5404
Audio & video equipment	987	376	348	333	803	1146
Other ICT goods	1217	993	1247	976	1380	2122
Total ICT imports	8495	7257	8701	6173	10634	14315
RUSSIAN FEDERATION						
Exports						
Communication equipment	98	131	105	166	271	476
Computer equipment	53	74	31	50	66	115
Electronic components	153	260	191	189	266	385
Audio & video equipment	267	30	39	28	28	38
Other ICT goods	346	260	643	463	526	666
Total ICT exports	917	755	1009	896	1157	1680
Imports						
Communication equipment	1492	690	1090	1376	3804	7035
Computer equipment	373	230	478	716	1609	3971
Electronic components	238	124	250	552	934	1359
Audio & video equipment	321	73	317	421	1352	4051
Other ICT goods	907	664	827	958	1166	2887
Total ICT imports	3332	1782	2963	4024	8865	19303
INDIA						
Exports						
Communication equipment	63	49	84	101	161	355
Computer equipment	249	118	346	390	409	347
Electronic components	112	133	202	327	424	692
Audio & video equipment	77	59	122	262	161	140
Other ICT goods	44	85	127	182	268	344
Total ICT exports	545	444	880	1262	1424	1877
Imports						
Communication equipment	280	352	753	2674	5402	8320
Computer equipment	637	1012	1237	1899	3469	4075
Electronic components	598	671	867	1286	1641	2291
Audio & video equipment	103	140	176	313	694	1436
Other ICT goods	378	441	530	695	1309	1968
Total ICT imports	1997	2617	3564	6868	12516	18091

	1997	1999	2001	2003	2005	2007
CHINA						
Exports						
Communication equipment	2685	3738	8759	14558	36303	82035
Computer equipment	7513	11697	21076	59245	104651	144514
Electronic components	4922	7766	11371	22879	46890	60841
Audio & video equipment	7168	8453	12616	24289	43265	59570
Other ICT goods	906	1009	1483	2332	4057	8608
Total ICT exports	23194	32663	55305	123303	235167	355568
Imports						
Communication equipment	2453	4904	7416	7812	6544	19618
Computer equipment	3864	6968	11607	22890	33705	38066
Electronic components	9664	18386	31333	67442	124455	173473
Audio & video equipment	1989	2345	2796	5438	8557	12148
Other ICT goods	1618	2169	4117	6949	9766	11891
Total ICT imports	19588	34771	57269	110530	183025	255195
SOUTH AFRICA						
Exports						
Communication equipment	119	182	219	186	193	274
Computer equipment	133	182	125	106	137	193
Electronic components	33	33	64	96	167	191
Audio & video equipment	32	42	55	79	99	212
Other ICT goods	77	86	81	148	201	271
Total ICT exports	394	525	545	615	798	1142
Imports						
Communication equipment	1211	1322	1165	1216	2342	2785
Computer equipment	1075	1104	991	1424	2303	2221
Electronic components	440	392	387	374	555	790
Audio & video equipment	358	336	328	441	798	939
Other ICT goods	433	370	383	483	742	972
Total ICT imports	3516	3524	3255	3939	6741	7707

Note: South Africa includes the South African Customs Union for 1996 through 1999.

Source: OECD, based on data from the joint OECD-UNSD ITCS database.

30. The market size of the global electronics industry is estimated to be USD2100 billion by 2010.[23] The Indian electronics industry still has a minuscule share (only 0.7%) of this global electronics hardware compared to neighbouring countries like China (14.6%), Chinese Taipei (3.5%), and Korea (7.2%).[24] But situation has changed in recent time as shown in Table 8. The growth in the value of electronic production is depicted for selected OECD and developing countries between 2005 and 2008. The growth rate of electronic production is much higher in India compared to many OECD countries. Only Brazil, the Slovak Republic and Vietnam productions are comparable with India during this time period.

[23] Electronics and Computer Software Export Promotion Council (ESC), Department of Commerce, Government of India, 2003.

[24] 2004-05 figure.

Table 8. Growth in the Value of Electronics Production, 2005-2008 (% per annum)

Country	EDP	Office Equip	Control & Instr	Medical & Industrial	Radio Comms & Radar*	Telecomm-unications	Consumer	Components	TOTAL
Australia	1.09	2.62	3.67	4.05	5.54	-0.76	-1.83	3.71	2.42
Austria	-4.83	0.00	10.39	3.53	3.13	7.47	-2.27	1.80	2.86
Belgium	-1.41	..	2.95	5.74	-0.65	-7.12	-3.78	2.07	-0.51
Brazil	27.26	14.41	14.98	8.88	16.81	15.75	14.80	14.28	21.24
Bulgaria	14.05	2.70	13.04	12.00	15.37	7.72	1.06	9.39	10.67
Canada	1.73	6.07	8.91	9.10	8.64	-1.33	-6.52	2.01	4.78
China	15.80	10.74	25.39	15.38	17.81	15.55	14.40	15.17	15.86
Croatia	10.33	0.00	6.27	6.27	9.14	5.27	..	14.05	8.17
Czech Republic	11.29	-1.94	9.99	7.07	11.64	8.02	28.69	-2.84	12.76
Denmark	6.64	..	8.63	10.79	2.60	11.03	1.36	2.26	6.93
Egypt	7.07	3.61	6.15	10.82	10.46	12.90	2.63	3.37	6.28
Estonia	14.67	0.00	-0.33	7.22	4.31	3.67	..	5.49	4.75
Finland	-3.15	..	7.34	8.49	-4.28	-2.85	5.27	0.25	-2.22
France	-13.80	6.74	7.71	9.47	-0.76	0.22	-3.81	1.82	-0.36
Germany	0.39	-4.15	8.62	6.19	-1.19	0.99	-4.19	9.08	4.76
Greece	11.84	3.45	6.38	18.98	7.72	10.85	0.00	21.14	10.54
Hong Kong, China	-18.53	-15.75	-4.75	-2.15	-8.33	-13.01	-10.46	-7.12	-10.23
Hungary	7.99	0.00	10.63	7.52	7.33	2.01	21.52	3.80	10.38
India	21.70	7.72	13.48	10.75	65.17	11.34	9.05	5.28	19.93
Indonesia	-0.66	-0.61	3.78	5.76	4.42	-11.13	-3.21	2.99	0.19
Ireland	7.67	1.72	11.64	2.47	14.14	-3.82	7.99	3.25	6.03
Israel	1.33	-11.17	5.96	10.70	2.81	0.82	-2.23	2.41	3.20
Italy	-2.43	-23.31	5.26	10.63	-2.48	3.09	7.34	3.11	2.14

Country	EDP	Office Equip	Control & Instr	Medical & Industrial	Radio Comms & Radar*	Telecomm-unications	Consumer	Components	TOTAL
Japan	-3.05	-7.02	-3.98	2.22	-5.16	-7.22	1.50	0.49	-1.31
Lithuania	7.24	10.06	7.56	32.64	43.42	37.00	-0.93	-19.66	0.68
Malaysia	13.67	34.03	16.39	23.52	20.89	11.31	-6.43	5.63	8.58
Mexico	3.06	10.72	5.90	1.50	7.67	-5.65	20.78	3.39	10.34
Netherlands	-2.82	-9.29	3.19	16.34	-8.16	2.33	-7.17	-1.15	1.76
New Zealand	5.70	-12.21	3.27	7.92	8.54	2.10	-8.53	10.90	5.99
Norway	0.99	..	5.53	7.72	4.70	5.17	..	20.10	6.58
Philippines	4.07	9.20	3.72	10.98	-5.94	-0.67	-4.16	3.93	3.34
Poland	5.98	2.17	2.96	4.91	7.31	4.01	31.06	-8.45	15.84
Portugal	-6.88	0.00	22.00	22.00	8.76	2.67	7.51	10.82	5.59
Puerto Rico	-11.26	-3.13	1.22	-15.93	4.32	0.50	-3.29	-6.62	-11.93
Romania	13.83	0.00	9.65	11.17	8.01	2.21	-2.27	5.90	6.43
Russia	14.92	2.91	6.99	6.14	11.24	5.27	11.04	7.76	9.55
Saudi Arabia	3.31	-1.34	4.87	2.62	7.41	2.89	-3.85	3.82	3.93
Singapore	-9.12	-4.22	4.23	17.92	5.76	0.15	-12.17	8.34	1.52
Slovakia	7.60	3.57	9.35	4.59	7.96	1.91	61.82	12.82	40.17
Slovenia	10.97	0.00	8.13	6.40	2.44	1.90	3.23	1.54	3.99
South Africa	0.48	-0.32	2.40	0.00	2.60	0.93	4.27	-1.09	1.32
South Korea	-5.00	-9.33	9.08	16.71	-2.42	-2.81	-3.88	0.84	-1.13
Spain	-1.52	-10.93	1.61	6.99	4.70	-3.45	-4.44	7.97	0.61
Sweden	-3.15	..	3.65	10.96	-2.69	0.56	9.49	1.22	0.06
Switzerland	-2.19	-10.74	6.76	6.85	0.53	-0.41	2.05	2.57	3.85
Chinese Taipei	-14.05	-9.62	18.17	33.19	3.23	-16.50	-2.16	10.02	7.38
Thailand	16.49	-2.90	18.59	17.74	6.62	1.26	12.05	13.97	14.07
Turkey	15.48	-5.80	0.66	3.98	1.64	0.48	0.82	6.73	2.01

Country	EDP	Office Equip	Control & Instr	Medical & Industrial	Radio Comms & Radar*	Telecomm-unications	Consumer	Components	TOTAL
United Kingdom	-21.47	-15.48	6.50	7.34	5.58	2.64	-7.60	-2.76	-1.34
Ukraine	11.32	3.23	5.07	9.31	7.00	3.70	3.45	5.36	6.52
USA	-1.21	-1.27	3.78	4.30	2.94	-0.78	-4.22	2.18	1.76
Venezuela	3.31	0.33	10.81	7.93	3.31	1.99	-2.57	9.35	4.90
Vietnam	35.29	6.35	10.85	7.60	11.76	-1.08	15.56	14.17	18.44
Total	**6.64**	**0.45**	**6.09**	**7.55**	**4.75**	**2.88**	**9.34**	**4.94**	**5.86**

Source: REED Electronics Research, November 2008, Production figure includes exports.

6. IT RELATED REVENUES, EMPLOYMENT, INVESTMENT AND SPENDING

6.1. Revenue from the IT Sector

31. Table 9 presents growth in revenue of the Indian IT sector (including the domestic and exports segments only for services/ITeS). Revenue is expected to exceed USD47.8 billion in 2006-07, an increase of nearly 28% compared to the previous fiscal year. Within this, service and software exports remain the major contributor, generating USD31.3 billion and outweighing forecasted growth of 32.6%. Increases in offshore product development and engineering services are supplementing India's efforts in IP creation. The engineering services and software product segment has increased at around 22% and is expected to report USD 4.9 billion in exports in 2007 as shown in Table 9.

Table 9. Revenue from Different Segments in the Indian IT Sector: 2004-2007

USD billion	**2004**	**2005**	**2006**	**2007**
IT Services	10.4	13.5	17.8	23.6
Exports	7.3	10.0	13.3	18.
Domestic	3.1	3.5	4.5	5.6
ITeS-BPO	3.4	5.2	7.2	9.5
Exports	3.1	4.6	6.3	8.4
Domestic	0.3	0.6	0.9	1.1
Engineering Services and R&D, Software Products	2.9	3.9	5.3	6.5
Exports	2.5	3.1	4.0	4.9
Domestic	0.4	0.8	1.3	1.6
Total Software and Services Revenues	16.7	22.6	30.3	39.6
Of which, exports:	12.9	17.7	23.6	31.4
Hardware	5.0	5.9	7.0	8.2
Total IT Industry ***(including Hardware)***	**21.6**	**28.4**	**37.4**	**47.8**

Note: Totals may not match due to rounding off, E is estimate; Hardware does not include export component.

*NASSCOM estimates have been reclassified to provide greater granularity. Historical values for a few segments have changed due to availability of updated information

Source: NASSCOM, Indian IT Industry, Fact Sheet (2006)

6.2. Employment Trends

32. Total employment in IT software and services expected to be 1.6 million in 2006-07. The growth of employment since 2003-04 is almost 50%. IT-services and ITeS-BPO related activities contribute about two-thirds of total employment. The contribution of employment in the domestic market is much less than in the export market. The rapid growth of the software segment has prompted to reduce the brain drain in the country. Non-resident Indians are returning to a greater extent in recent years. Moreover, non-resident Indians working in US multinationals are investing in Indian subsidiaries that develop software for their US operations (see Kumar and Joseph, 2005). Table 10 presents the sector's employment data. This excludes the hardware segment that is estimated to provide direct employment of 1.2 million in 2008. Recent meltdown in the world market may create down-ward pressure for employment due to decrease in demand for outsourcing services.

Table 10. Employment-Software and Services Sector

Sector	2004	2005	2006	2007
Export sector IT Services	215000	297000	398000	562000
ITeS-BPO	216000	316000	415000	545000
Engineering Services and R&D and Software Products	81000	93000	115000	144000
Domestic Market (including user organizations)	318000	352000	365000	378000
TOTAL*	830000	1058000	1293000	1630000

*Figures do not include employees in the hardware sector

Source: NASSCOM, Factsheet (February, 2007)

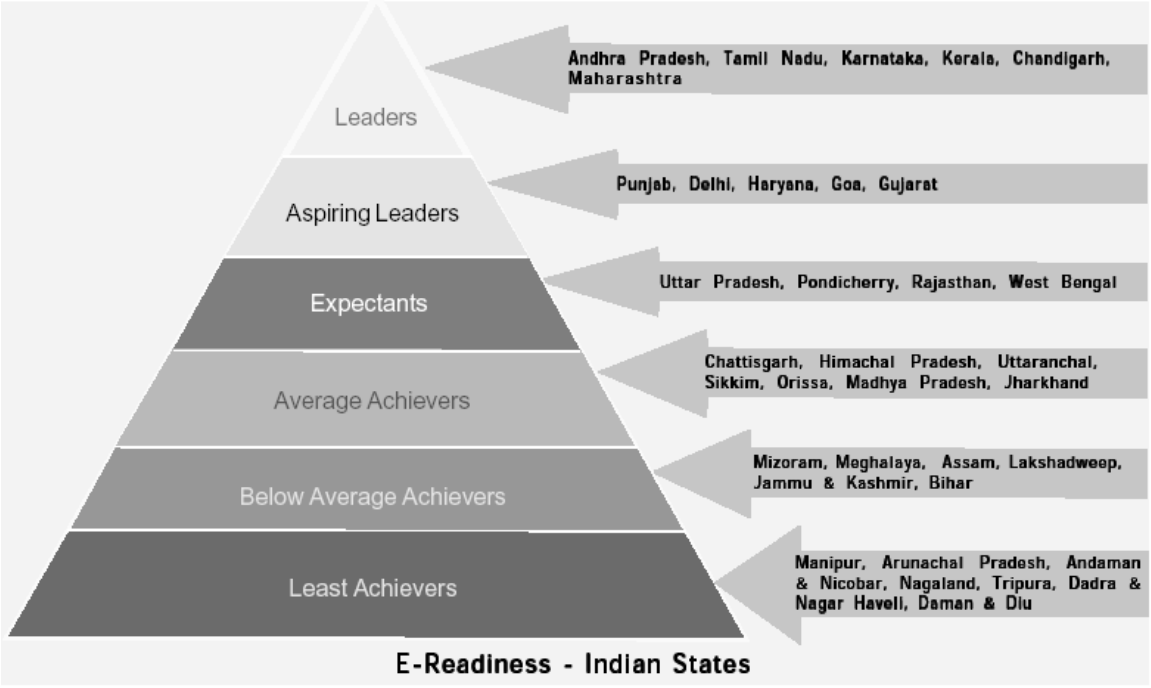
6.3. E-Readiness and Investment Environment

33. IT/ITeS companies have created a positive impact on education, health, rural development, livelihood, women and children.

6.3.1. E-Readiness

34. The National Council of Applied Economic Research (NCAER), a leading Indian research institution based in Delhi, has established an E-Readiness index considering relevant variables within three broad indicators viz., environment, readiness of individuals and usage. Multiple stage Principal Component Analysis (PCA) is used for this purpose. A pyramid showing e-readiness of all states and territories is presented here in Figure 6.

Figure 6. E-Readiness-Indian States



Source: National Council of Applied Economic Research (NCAER), India: E-Readiness Assessment Report, 2005

35. In all, 21 states have been grouped according to the level of development of Science and Technology (S&T), which is determined in the context of their economic and wellbeing status. Delhi, Goa, Tamil Nadu, Kerala and Andhra Pradesh have emerged as the 'most advanced', and are ranked highest with a score of above 0.70. The 'more advanced' states are a step below with scores ranging between 0.42 and 0.70. These include Maharashtra, Karnataka, Gujarat, Uttaranchal and Punjab. The third 'less advanced' states are those with S&T Index scores of between 0.16 and 0.42 including West Bengal, Assam, Haryana, Himachal Pradesh, Orissa and Uttar Pradesh. Finally, at the bottom of the S&T ladder are the 'least advanced' states with scores less than 0.16 – Chattisgarh, Bihar, Jharkhand, Madhya Pradesh and Rajasthan as shown in Table 11.

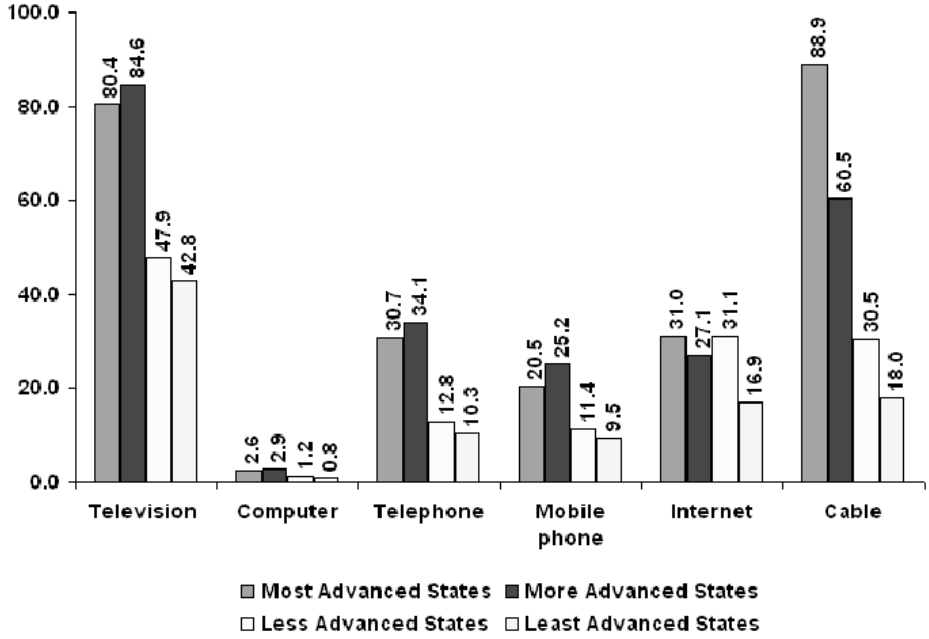
Table 11. Grouping of the States, 2004-05

Most advanced states (S&T index >0.70)	More advanced states (S&T index > 0.42&□0.70)	Less advanced states (S&T index > 0.16&□0.42)	Least advanced states (S&T index □ 0.16)
Delhi	Maharashtra	West Bengal	Chattisgarh
Goa	Karnataka	Assam	Bihar
Tamil Nadu	Gujarat	Haryana	Madhya Pradesh
Kerala	Uttaranchal	Himachal Pradesh	Jharkhand
Andhra Pradesh	Punjab	Orissa	Rajasthan
		Uttar Pradesh	

Source: NCAER, Working Paper, May, 2006

36. The welfare status of the population in different states is indicated by access to 'assets' such as TV sets, computers, telephones, internet and cable services and mobile phones. While the top two groups of states have a higher penetration of televisions, telephones, mobile phones, internet and cable services, the corresponding penetration for the bottom two groups is much lower as shown in Figure 7.

Figure 7. Ownership of Selected Goods and Services (% households own), 2004-05



Source: NCAER, Working Paper, May, 2006

6.3.2. Investment Environment

37. India still faces many deficiencies compared to its neighboring competitors. A poor investment climate and a policy structure non-conducive to hardware manufacturing still hinder significant foreign investment in this sector**.**

6.3.3. R&D, Patents in ICT

38. India's total R&D investment is only 0.8 % of GDP which is very low compared to other countries such as China (1.31%), Brazil (1.05%) and Denmark (2.63%). The emergence of India as a world centre for outsourcing and IT software services is helping to change the public perception of India. Around 600 MNCs have captive centres in India. 150 of the Fortune 500 companies have R&D centres in India. Investment in R&D by the private sector is still very insignificant and based on outsourcing market. Indian companies such as HCL, MindTree, TCS, Wipro and others are well-placed in global market[25] But R&D institutions lack resources and industry support.[26] The education system is not standardized across various states to meet the demand for labor in the sector. For example, there are around 800 IT product managers in the country.[27] MNCs in the revenue range of $100-200 million are the most troubled one, in hiring the right quality people. Currently industry partners play very insignificant role in the accreditation process. Public-private partnering is still very poor in this respect. Government bodies such as the Technology Information Forecasting and Assessment Council (TIFAC) of the Department of Science and Technology

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25 For outsourcing industry, Intellectual Property Rights (IPRs) belong to the customer, so there is no multiplier effect.

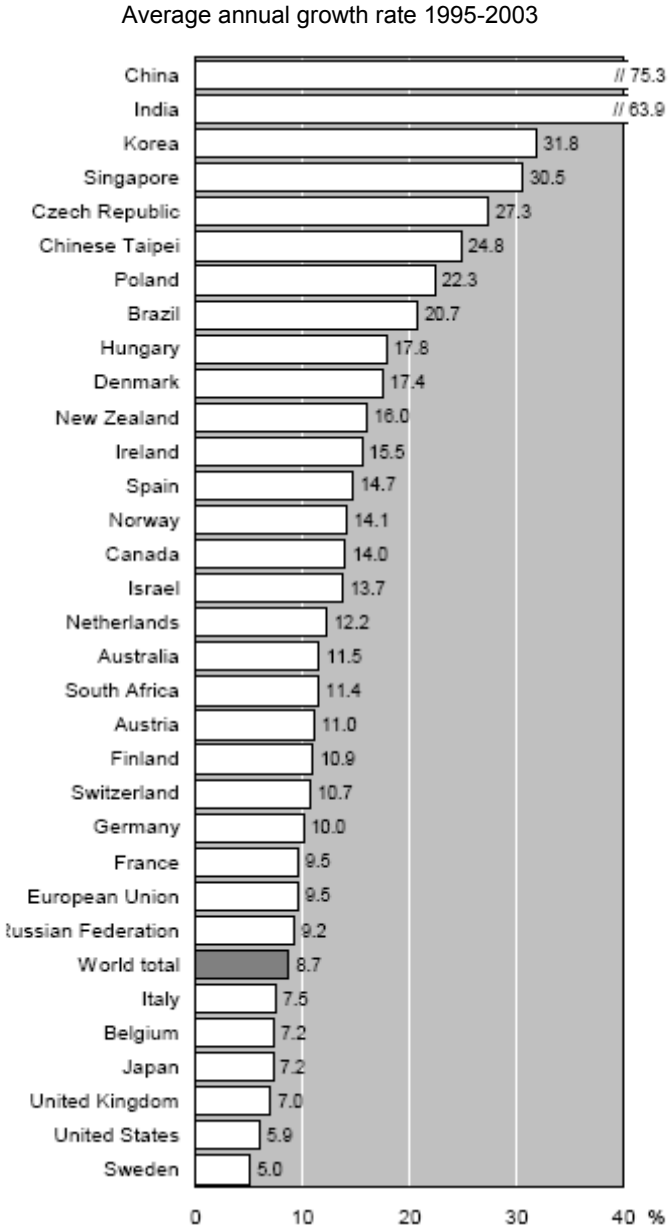
26 150% tax deduction is allowed under Section 35(2AB) of the Income Tax Act on expenditure in scientific research in the area of electronics/IT sector.

27 Estimated by the Zinnov, a consulting firm (Economic Times, 12 February, 2008).

has been actively associated as an interface in bringing academic institutions and industry partners together.

39. Figure 8 depicts trends in ICT-related patent applications to the European Patent Office (EPO). In terms of average annual growth rates, India ranks second after China in patent applications through the EPO between 1995 and 2003. Its annual growth rate is seven times the world total for patent applications for this period.

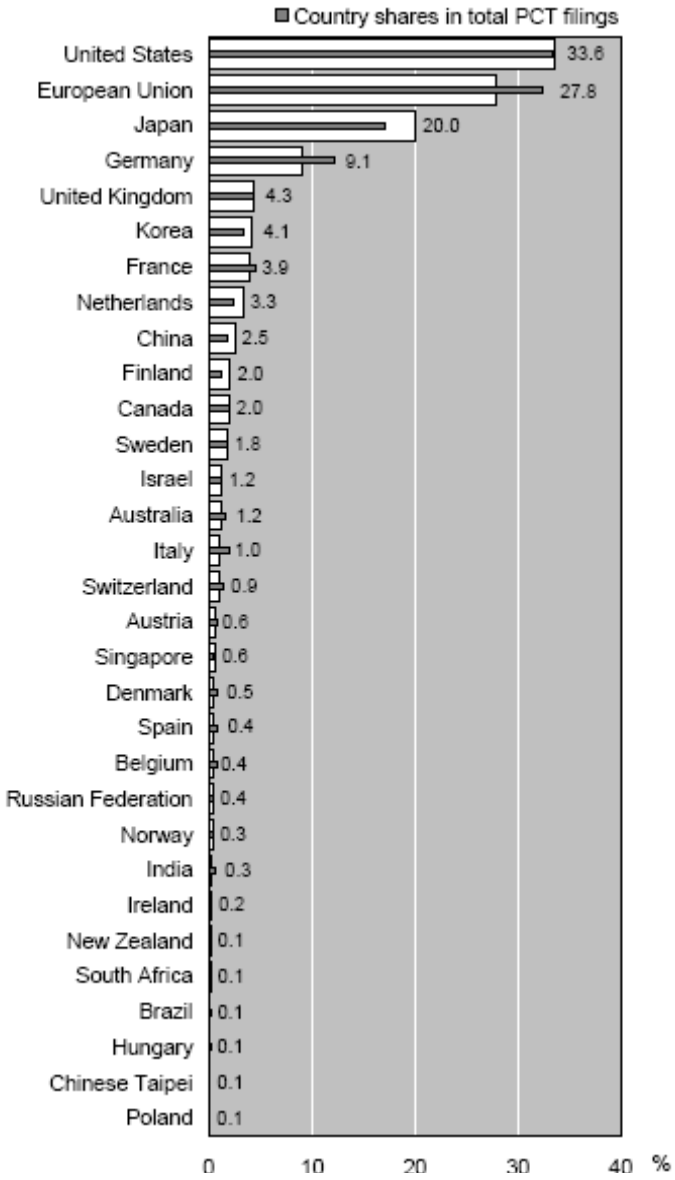
Figure 8. Trends in ICT-related patent applications[1] to the EPO[2]



Note: Patent counts are based on the priority date, the inventor's country of residence and fractional counts.
1. The definition of ICT-related patents includes Telecommunications, Consumer Electronics, Computers, Office Machinery and Other ICT.
2. The graph only covers countries/economies with more than 100 patent applications to the European Patent Office (EPO) in 2003.
3. Patent applications filed under the Patent Co-operation Treaty (PCT), at international phase, designating the EPO.
4. The graph only covers countries/economies with more than 250 patents filed under PCT for the period of 2002-04.
Source: OECD, Patent database, June 2007.

40. Despite the rapid growth of patent applications the number from India remains low. Figure 9 presents the share of countries in ICT-related patents filed under the Patent Co-operation Treaty (PCT) in 2004. India's share is very insignificant (0.3%) compared to other Non-OECD countries like China (2.5%).

Figure 9. Share of countries/economies in ICT-related patents[1] filed under PCT,[3] 2004



Note: Patent counts are based on the priority date, the inventor's country of residence and fractional counts.

1. The definition of ICT-related patents includes Telecommunications, Consumer Electronics, Computers, Office Machinery and Other ICT.

2. The graph only covers countries/economies with more than 100 patent applications to the European Patent Office (EPO) in 2003.

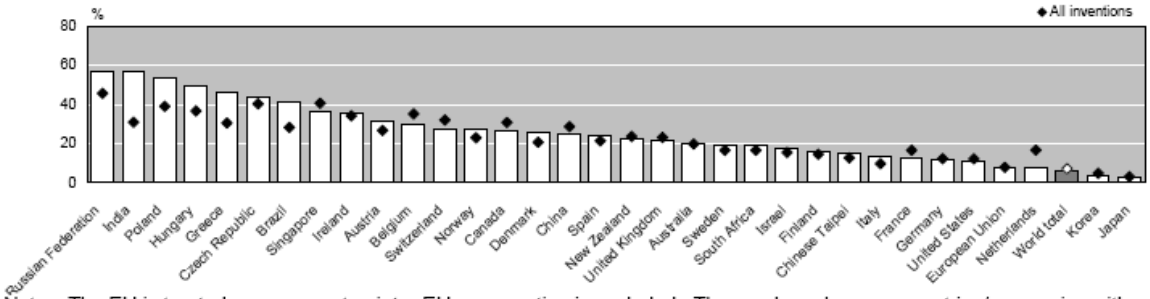
3. Patent applications filed under the Patent Co-operation Treaty (PCT), at international phase, designating the EPO.

4. The graph only covers countries/economies with more than 250 patents filed under PCT for the period of 2002-04.

Source: OECD, Patent database, June 2007.

41. In providing a picture of the role of foreign co-inventors in India, Figure 10 ranks most OECD and some non-OECD countries, India.

Figure 10. ICT-related patents with foreign co-inventors, [1]2001-2003



Notes: The EU is treated as one country; intra-EU co-operation is excluded. The graphs only cover countries/economies with more than 50 EPO patent applications in ICT over the period 2001-2003.

1. These indicators are defined in sections 6.1 and 6.2. The definition of ICT-related patents is presented in the methodological box 3.1.

Source: OECD, Patent database, June 2007.

6.3.4. Foreign Investment

42. According to a review report by the Department of Industrial Policy and Promotion (DIPP), FDI as a proportion of total investment has more than doubled between 2003-04 and 2006-07. The share of FDI in GDP has increased from 0.77% to 2.31% in the last financial year 2006-07. De-licensing of various sectors and ease of doing business by foreign companies has boosted the performance. A breakdown of FDI in different sectors is presented in Table 12. Electrical equipment (including computer software [this is usually with services!] and electronics) attracts the highest inflows of FDI, followed by services (financial and non-financial) and telecommunications. In recent times, several EMS (Electronic Manufacturing Services) firms, including Flextronics, Honhai/Foxconn, Solectron Centum, Celestica and Jabil Circuits etc set up their operations in mobile phone markets in India. Peripherals manufacturers such as TVS electronics, WeP Peripherals and Emerson have set up manufacturing facilities in Himachal Pradesh. The semiconductor segment is in its early phases and needs further attention from the government. In the audio sector, absence of investments in organized segments and a high tax rate have resulted in poor quality product with high costs to consumers.

Table 12. Sectors attracting highest FDI inflows

Amount in Rupees crore and in USD in million in parentheses

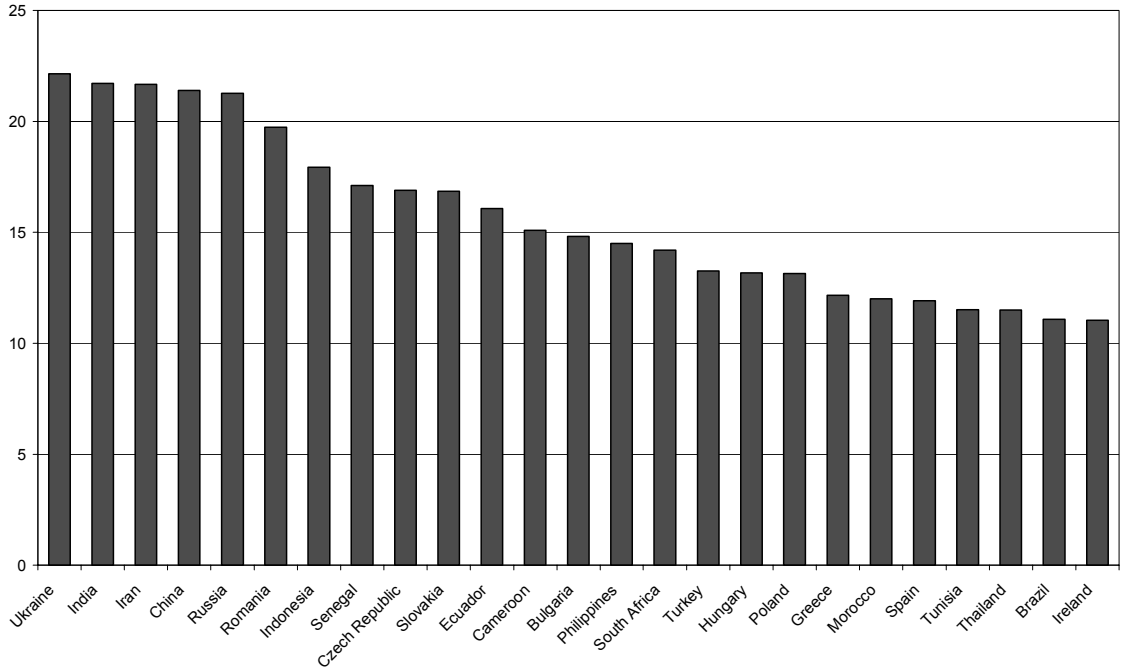
Ranks	Sector	2003-04	2004-05	2005-06	2006-07 (April – Sep)	Cumulative inflowsFDI (from Aug 1991 to Sep 2006)	Share of inflows (in per cent)
1	Electrical Equipment s (including computer software and electronics)	2,449(532)	3,281(721)	6,499(1451)	3,601(778)	27,311(6,272)	17.54
2	Services Sector (financial & non-financial)	1,235(269)	2,106(469)	2,565(581)	6,955(1,509)	19,759(4,600)	12.69
3	Telecommunications (radio paging, cellular mobile, basic telephone services)	532(116)	588(129)	3,023(680)	3,835(405)	16,172(3,776)	10.39
4	Transportation Industry	1,417(308)	815(179)	983(222)	1,187(259)	14,502(3,436)	9.31
5	Fuels (Power +Oil refinery)	521(113)	759(166)	416(94)	632(138)	11,608(2,720)	7.45
6	Chemicals (other than fertilizers)	94(20)	909(198)	1979(447)	439(95)	9,019(2,238)	5.79
7	Food Processing Industries	511(111)	174(38)	183(42)	150(33)	4,852(1,212)	3.12
8	Drugs and Pharmaceuticals	502(109)	1,343(292)	760(172)	219(48)	4,531(1,055)	2.91
9	Metallurgical Industries	146(32)	881(192)	681(153)	511(111)	3,328(766)	2.14
10	Cement and Gypsum Products	44(10)	1(0)	1,970(452)	96(21)	3,327(768)	2.14

Source : FDI Data Cell, Ministry of Commerce

ICT Spending: A Comparison

43. Figure 11 presents the growth of IT spending of 25 countries including the BRICS (*i.e.* Brazil, Russia, India, China and South Africa) between 2000 and 2007. ICT spending is increasing rapidly in some emerging non-member economies as shown here. China's ICT spending is estimated to have exceeded USD 170 billion during 2007, having grown by more than 21% per annum since 2000. ICT spending in India and Russia has increased just as rapidly over the period, with spending increasing 21.3% per annum to USD 35 billion in Russia, and by 21.7% per annum to USD 66 billion in India. In terms of growth in ICT spending between 2000 and 2007, Ukraine ranks first in the world, followed by India. China was fourth, Russia fifth, the Czech Republic eighth, the Slovak Republic ninth, South Africa fourteenth and Brazil twenty-fourth.

Figure 11. Fastest ICT Spending Growth, 2000-2007
Annual average growth, %



Note: Includes the 25 fastest growing markets.

Source: OECD, based on data provided by WITSA.

44. Table 13 presents ICT spending for the emerging economies viz., China, Hong Kong, China, Chinese Taipei, India, Russia, Brazil and South Africa for different segments for the period between 2000 and 2007. While China is the leader in spending on software and IT services, India is ahead of China in spending on hardware and communications segments. Overall growth is higher in the case of India (viz., 296%) compared to China (i.e., 289%), and India is the leader amongst these emerging countries for this seven year period.

Table 13. Emerging Economy ICT Spending by Segment, 2000-2007
Million US Dollars in current prices

	2000	2003	2004	2005	2006	2007	Growth (percentage point)
IT HARDWARE							
China	12 507	27 027	39 057	47 927	57 813	68 303	4.46
Hong Kong, China	1961	1 921	1 980	2 026	2 015	2 001	0.02
Chinese Taipei	2767	3 605	4 148	4 391	4 550	4 871	0.76
India	2257	5 013	7 204	10 264	13 630	17 910	6.94
Russia	1816	2 881	3 900	4 852	5 574	6 078	2.35
Brazil	6263	9 905	12 407	15 946	17 316	17 454	1.79
South Africa	1661	2 503	3 457	4 024	4 412	4 646	1.8
SOFTWARE							
China	1085	3 344	5 295	7 940	11 376	16 328	14.05
Hong Kong, China	278	373	432	492	558	649	1.33
Chinese Taipei	519	860	1 046	1 228	1 408	1 690	2.26
India	358	948	1 350	1 908	2 519	3 336	8.32
Russia	343	570	742	923	1 056	1 182	2.45
Brazil	1602	2 469	2 877	3 566	3 828	3 803	1.37
South Africa	627	1 328	1 965	2 369	2 781	3 159	4.04
IT SERVICES							
China	851	3 591	6 203	10 006	15 539	24 081	27.3
Hong Kong, China	540	747	903	1 071	1 266	1 532	1.84
Chinese Taipei	788	1 226	1 478	1 731	1 973	2 358	1.99
India	1120	2 859	3 876	5 243	6 607	8 356	6.46
Russia	891	1 537	2 099	2 747	3 299	3 881	3.36
Brazil	4937	7 353	9 040	11 911	13 530	14 238	1.88
South Africa	1293	2 440	3 632	4 408	5 206	5 951	3.6
COMMUNICATIONS							
China	29917	41 437	47 102	51 759	57 586	63 668	1.13
Hong Kong, China	9098	9 595	11 662	12 240	12 807	13 851	0.52
Chinese Taipei	14200	12 570	13 247	14 367	14 949	16 305	0.15
India	12841	16 873	23 734	29 023	32 549	35 978	1.8
Russia	6064	11 566	14 798	18 806	21 695	24 017	2.96
Brazil	20 609	21 491	24 006	30 642	33 996	34 240	0.66
South Africa	6896	8 947	11 709	12 825	13 073	12 792	0.85
TOTAL ICT							
China	44359	75 400	97 658	117 632	142 313	172 380	2.89
Hong Kong, China	11878	12 637	14 977	15 829	16 646	18 033	0.52
Chinese Taipei	18274	18 262	19 920	21 718	22 879	25 223	0.38
India	16575	25 692	36 164	46 438	55 304	65 580	2.96
Russia	9114	16 554	21 539	27 327	31 624	35 158	2.86
Brazil	33410	41 217	48 330	62 065	68 670	69 734	1.09
South Africa	10477	15 217	20 763	23 625	25 471	26 549	1.53

Notes: Data for 2006 and 2007 are forecasts.

Source: OECD, based on data provided by the WITSA.

7. DRIVING FACTORS

45. The Indian government initiated efforts to provide dedicated, international quality, cost effective real estate at software parks, Special Economic Zones (SEZ) and knowledge sector industrial estates. Availability of high quality international and national dedicated telecommunication infrastructure is a major driver. Moreover, the cost advantage of sourcing from Indian IT/ITeS companies was due to the lower wages and lower cost of living. As shown in Figure 2, the Indian economy has comparative advantages in skilled workers compared to its competing nations. However, increasing demand for human resources has gradually added pressure to labour costs in recent years, forcing companies to revamp human resource management practices and to choose alternative locations. We discuss here the relevant driving factors behind the growth of this sector.

7.1. Human Capital

46. With nearly 60% of its population between the ages 15-59, and more than 50% below the age of 25, India has a vast pool of labour. In contrast, countries including the US, Europe, Japan, Korea and China have an ageing population with dependency ratios likely to increase over the years. Despite the lack of universal literacy, the Indian education system creates a large number of professional IT personnel. Indian curricula are heavily based on science, mathematics and engineering creating a suitable environment for producing IT professionals. Indian education tends to underestimate the importance of learning with creative activities. Therefore, there is always a mismatch between the knowledge and real practice amongst the professional labor force, resulting in limited opportunities with low salaries. There is a mismatch between education and the labor market. Table 14 depicts the labor supply of this sector. Based on forecast figures for 2007-08, growth of the labor supply is 69% over the five year period. Even at current levels of employability, India has the largest pool of suitable offshore talent, accounting for 28% of the total suitable pool available across all offshore destinations.[28]NASSCOM estimates an additional demand for 850,000 IT and 1.4 million ITeS professionals will be needed in 2009-10 financial year.

Table 14. Indian IT Labour Supply: IT Software and Services

	2003-04	2004-05	2005-06	2006-07	2007-08
Degree (four years)	139 000	170 000	222 000	270 000	290 000
Diploma & MCA (three years)	177 000	195 000	219 000	231 000	246 000
No of engineering graduates	**316 000**	**365 000**	**441 000**	**501 000**	**536 000**
Of which:					
Engineering IT graduates (degree)	84 000	102 000	133 000	162 000	180 000
Engineering IT graduates (diploma)	95 000	99 000	113 000	118 000	123 000
**No of IT professionals	**179 000**	**201 000**	**246 000**	**280 000**	**303 000**

Note: ** IT professionals include Computer Science, Electronic and Telecom professionals. Figures do not include employees in the hardware sector, Source: NASSCOM, Knowledge Professionals Factsheet (2006)

7.2. Business Policy and Regulatory Environment

47. In encouraging foreign participation in most sectors of the economy, policy makers in India have placed special emphasis on recognising its importance not only as a source of finance but also as a facilitator of knowledge and technology transfer. The Indian ITeS-BPO sector has benefited from this approach, with participating firms enjoying minimal regulatory and policy restrictions along with a broad range of fiscal and procedural incentives.[29] Indian labour laws are flexible and mostly non-union workers

[28] NASSCOM

[29] NASSCOM, ITeS-BPO Factsheet, August 2007

are involved in the IT sector due to the better working conditions, salaries and other job-related opportunities they receive compared to employees in other sectors. The Information Technology (IT) Act, introduced in 2000 covers comprehensive legislation including copyright protection and cyber laws.

7.3. Telecommunication Network

48. Telecommunication plays a major role in the growth of the IT sector. India is one of the fastest growing telecom markets in the world. The CAGR of Indian telecom industry was 22 percent from 2002-03 to 2006-07; tele-density is 19.86% at mid 2007. Revenue from telecom was USD 20 billion and expected to be USD43 billion in 2009/10. FDI inflow in the Indian Telecom sector is very significant amongst all sectors. It is emerging as a telecom manufacturing hub. Within about a decade, the Indian telecom sector has shifted from a public sector monopoly to a free-competitive market. Prior to deregulation the Department of Telecommunications was the sole provider within the sector. The establishment of the Telecommunications Regulatory Authority of India (TRAI) in 1997 was the first step in reforming this sector. Since 1992, mobile services, followed by fixed line services in 1994 and long distance services in 1999 opened to private competitors. During 2005-06, the wireless connections increased at 78%, whereas landlines registered a negative growth. This figure is still much lower than other competitors such as Brazil (about 60%), China (about 56%) and Mexico (about 63%) in 2005 as shown in Table 14. FDI in telecom sector has increased from USD116 million to USD521 million between 2003/04 and 2006/07. The large multinational corporation like AT&T is operating in India over six years in partnership with VSNL. India is the highest revenue generating market of the 13 economies where AT&T operates in the Asia-Pacific region excluding Japan.

49. The Telecom equipment sector includes many manufacturing plants established by companies like SemIndia, Siemens, Flextronics, Nokia, LG, Samsung, Ericsson, Motorola and Vodafone. For example, 40% of software used in Motorola phones worldwide is designed in India including MOTOSLVR™, MOTORAZR™ and MOTO Q™ phones.

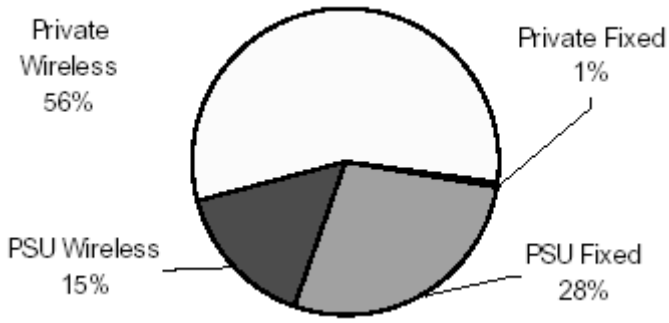
Table 15. Status of Telecom Indicators in some Countries as on December, 2005

Country	Population (Million)	GDP (per capita) USD 2004	Telephones (thousands)	Tele density (% age)	Internet Users (thousands)
USA	298.21	36273	360347	122.71	185000
UK	59.67	26369	94791	158.51	37600
Australia	20.16	25436	29880	148.25	14190
Brazil	186.41	3338	107987	59.78	22000
Mexico	107.03	6328	66974	62.58	18622
Sri Lanka	20.74	1031	4606	22.20	280
Korea (Rep)	48.29	14136	62087	128.56	33010
Japan	128.08	31324	153525	119.86	64160
Indonesia	222.87	1156	59682	26.79	16000
China	1315.84	1268	743861	56.53	111000
Pakistan	153.96	614	18049	11.72	10500
India *	1115.59	634	142092	12.74	60000
World	6728.08	5944	3309379	49.45	964272

* As of March 31, 2006

Source: International Telecommunication Union, 2005

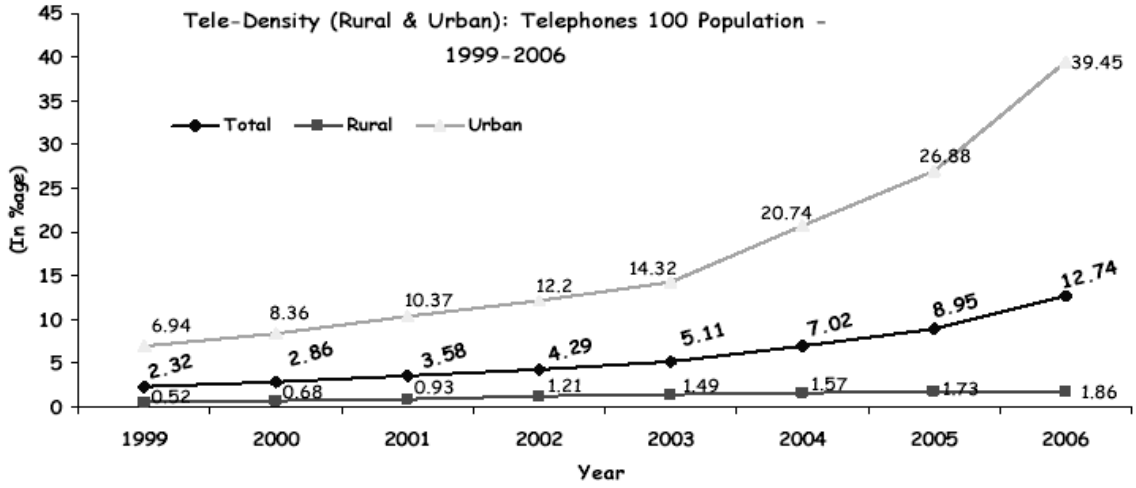
Figure 12. Distribution of Telephones in March 2006



Source: Report of the Working Group on the Telecom Sector for the 11th Five Year Plan (2007-12), PSU: Public Sector Unit

50. Figure 12 presents the distribution of fixed versus wireless lines in 2006. As mentioned above, tele-density in the country has steadily increased in recent years. However, there is a wide gap between urban tele-density (39.5%) and rural tele-density (1.9%) as shown in Figure 13. Rural telephony has not kept pace with the impressive growth in urban connectivity.

Figure 13. Tele-Density (Rural and Urban) Telephones 100 Population-1999-2006



Source: Report of the Working Group on the Telecom Sector for the 11th Five Year Plan (2007-12)

51. India's robust, approximately 170 million telephone network, including mobile phones, is one of the largest in the world and second largest among emerging economies (after China) with a wide range of services such as basic, cellular, internet, paging, V-SAT.[30] Recently, India has surpassed Russia to become the third largest mobile market in the world after China and the United States.[31] The status of the network is shown in Table 15 below as in 2006:

30 The mobile connection in India uses two technologies: GSM stands for Global System for Mobile Communication and CDMA stands for Code Division Multiple Access. They represent different systems of sharing of the radio spectrum for communication.

31 Source: Reuters, 19 February 2007

Table 16. Telecom Network Status in India: August 2006

Number of telephone connections	170 million (as on 30.9.06)
Number of telephone exchanges	37979 (PSU)
Switching capacity (Public)	83 million (PSU)
Village public telephones	5,51,064
Wireless (CDMA&GSM) subscribers	123.45 million
Broadband subscribers	1.64 million
Optical fibre route length (Public)	502008 KM
Microwave route length (BSNL)	64036 KM

Source: Report of the Working Group on the Telecom Sector for the 11th Five Year Plan (2007-12)

52. Basic services comprise fixed use line and wireless in local loop (WLL-fixed) services. Bharat Sanchar Nigam Limited (BSNL) and Mahanagar Telephone Nigam Limited (MTNL) are two major operators. Private players are Bharti and Reliance. The number of wireless subscribers has increased from 13.3 million in 2003 to 101 million in 2006, exhibiting a compound annual growth rate (CAGR) of 97%. The number of mobile subscriber is expected to reach around 500 million in 2010. In handset market, Nokia dominates with 72.5% of market share followed by Motorola with 11.1%, LG with 11%, Sony Ericsson (6.5%) and Samsung (5.6%) of total volume.

53. During 2005-06, the number of Internet subscribers increased by 25%, while the broadband subscribers increased from 0.18 million to 1.32 million. 2007 was declared as the "Year of Broadband" in India. Total number of internet subscribers increased at a CAGR of approximately 60% from 1997-98 to 2006-07. Top 5 internet service providers were BSNL (45.2%), MTNL (19%), Sify (8.9%), Bharti-Airtel (6.8%) and Reliance (6.1%) in 2007.

54. Further, the National Internet Exchange of India (NIXI) has been set up by the Department of Information Technology (DIT) to ensure that Internet traffic, originating from and destined for India is routed within India. This will reduce the cost of internal usage to a greater extent. Also, the plan for introducing 3G services and WiMax will reduce the cost of broadband accessibility.

8. MAJOR POLICY CHANGES: DIFFERENT INITIATIVES

55. The IT sector plays a major role in the Indian economy. Policies implemented both in micro and macro aspects may affect this sector. Here we highlight some major policy changes in improving human capital, exports, and e-governance. In this respect, we also discuss recent initiatives by the NASSCOM.

8.1. Human Capital

56. Investment in human capital is the most important initiative. Many initiatives have taken place at different levels. The National Council for Education Research and Training (NCERT) introduced the National Curriculum Framework School Education in 2000. Major objectives of this framework include the use of computers in the curriculum, enhancing learning opportunities by using ICT across the curriculum, designing curriculum with inter-disciplinary and cross-disciplinary areas.[32]

8.2. The Role of NASSCOM

57. In extending India's leadership in the global IT-ITeS stage, the NASSCOM and industry have already taken several initiatives to further enhance the availability of and access to suitable talent for IT-ITeS in India. These initiatives include:

8.2.1 Special Economic Zones for education:

58. NASSCOM has suggested experimenting with adapting the Special Economic Zone concept (deregulation and removal of restrictions) for education, and creating Special Education Zones. However, long term steps are required, including much higher government investment in education, major education reform, and better compensation and research grants for teachers/researchers. [33]

8.2.2 Memorandum of Understanding with University Grants Commission and All India Council for Technical Education

59. NASSCOM in combination with the University Grants Commission (UGC) and the All India Council for Technical Education (AICTE) has signed a Memorandum of Understanding (MoU), to strengthen professional education in meeting increasing demand in the sector through changes in curricula, faculty and infrastructure.

8.2.3 Industry-Academia Partnership

60. NASSCOM in its IT Workforce Development (ITWD) initiative is also working with academia across the country to encourage and facilitate greater industry interaction, thus helping them share relevant feedback, stay updated on developments in the industry and giving them an opportunity to incorporate positive changes in their curriculum and pedagogy.

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32 Refer http://ncert.nic.in/

33 Source: NASSCOM, Indian IT Industry Factsheet, February 2006.

8.2.4 Certification Program for Frontline Management

61. Under the NASSCOM's Executive Development Programme (NEDP), NASSCOM and QAI the leading quality consultancy in India introduced the first-of-its-kind Certification Program for Frontline Management in the ITeS-BPO sector. The program has been launched nationally and was staged in five major metros- Delhi, Mumbai, Bangalore, Chennai, and Hyderabad- in 2005. In future, this will be extended to other cities like Pune, Kolkata, Chandigarh, and Jaipur.

8.2.5 National Assessment of Competence (NAC)

62. NASSCOM has launched the NAC program for potential employees in the BPO segment. NAC is an industry standard assessment and certification program, which ensures the transformation of a "trainable" workforce into an "employable" workforce.

8.2.6 National Skills Registry (NSR)

63. In dealing with issues such as governance, physical security, business continuity, logical security, safeguarding IP, software change management and personnel security both for employees and clients more effectively, NASSCOM in collaboration with the National Securities Depository Limited (NSDL) introduced the NSR scheme in 2006. This is a national database of employees working in IT/BPO industry in India, This database contains third party verified personal, qualification and career information on IT professionals.[34]

8.2.7. Data Security Council of India (DSCI)

64. NASSCOM is involved in making establishing the Indian Information Security environment comparable to the world standard. As a part of its trusted sourcing initiative, NASSCOM is in the process of introducing the Data Security Council of India (DSCI), a Self Regulatory Organization (SRO) to establish, popularize, monitor and enforce privacy and data protection standards for the ITeS-BPO segment.[35] The Indian Computer Emergency Response team (CERT-In) provides incident prevention and response services under the Department of Information Technology.

8.3. Export Promoting Policies

65. In order to promote exports from India, the Indian Government has initiated several schemes to attract and encourage entrepreneurs to manufacture and export various products. Free Trade Zones provide competitive infrastructural facilities, duty free imports of capital goods, raw materials, components of other inputs, tax holidays against exports and access to domestic markets. These are Export Oriented Units (EOUs) within Export Processing Zones (EPZ), Electronic Hardware Technology Parks (EHTP), and Software Technology Parks (STP).

8.3.1. Special Economic Zone (SEZ)

66. The objective of these SEZs is to provide an export environment, with low barriers in the form of regulations on taxes, duties, labor laws and business infrastructure. Under the Act, SEZs can be developed either jointly or severally by the central government, state government, or any individual party (including private) Units may be set up in SEZ for the manufacture of goods and rendering of services. All the import/export operations of the SEZ units are on a self-certification basis. The units involved are a net

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34 Details are at www.nationalskillsregistry.in

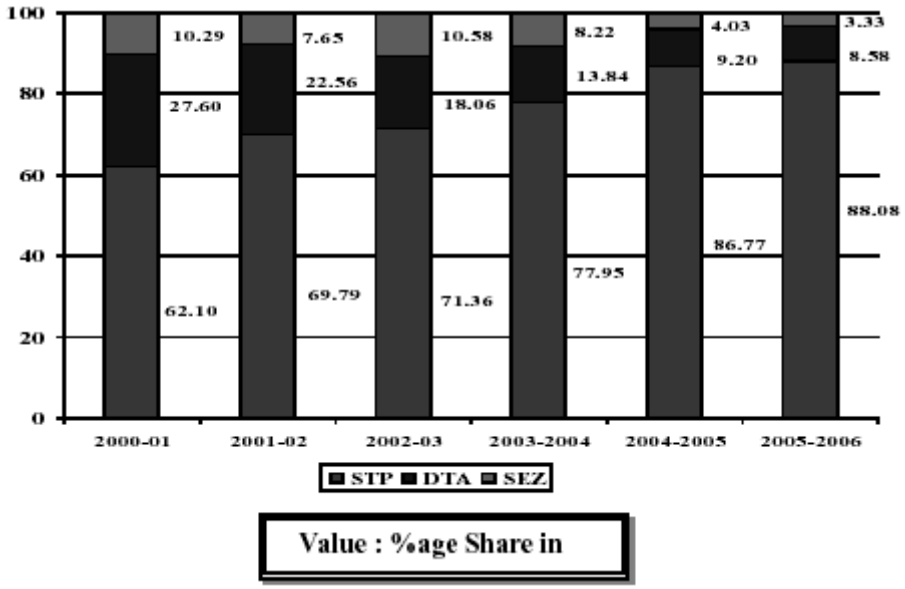
35 NASSCOM (July, 2007).

foreign exchange earner, not subject to any pre-determined value addition or minimum export performance requirements.

8.3.2. Software Technology Park (STP)

67. The STP is a non-profit society under the Ministry of Information Technology, Government of India to promote and facilitate exports of software. Each STP offers all statutory services and high speed data connectivity to its member companies as 100% export-orientated units. There are now 47 centres spread across the country assisting about 6500 software exporting companies. In 2000, a new STP was developed in Silicon Valley, with a view to facilitate software export by small and medium sized firms to the US. Similar services are being provided to electronic hardware exporting companies under the Electronic Hardware Technology Parks (EHTP) scheme. The STPs with a share of 88 % remained the largest contributor to India's electronics and computer software / services exports during the year 2005-06. The STPs have contributed the largest share of exports since 2000-01 as shown in Figure 14.

Figure 14. Distribution of exports from DTA, SEZ and STP of electronics and computer software/services: 2000-01 to 2005-06



Source: Statistical Year Book 2005-06, Electronics and Computer Software Export

68. Mode Projects (MMP) at central, state and local levels within the NeGP. At the state level the MMP includes the use of IT services around road transport, land records, commercial taxes, employment exchanges, agriculture, civil supplies, treasuries, land registration and in education. At the central level, it will include areas such as insurance, national ID, pensions, banking, passport, visa and income tax. The government has recently approved 100,000 broadband internet common service centres (CSCs) in rural areas. The State Wide Area Network (SWAN) is an excellent initiative and needs to be reached at the village level. Introduction of non-English software has started and needs to be extended to cover a large section of the non-English speaking population.

9. CONCLUSIONS

9.1. Key Challenges

69. The Indian IT sector plays a significant role in the global market. In recent years, rising factor costs, competition from China, Latin America and Eastern Europe as other outsourcing countries, strong competition from global firms (e.g., Accenture, HP Services and IBM Global Services) in establishing delivery centres in India, manpower supply constraints, the presence of a small number of large firms dominating the industry, high tariff and import duties, lack of commercialisation of domestic R&D and lack of adoption in key vertical sectors such as agriculture, education and healthcare are identified as major limitations of this sector compared to other countries.

70. ICT not only forms the basis of rapid and effective communication at all levels viz., individual, business and government, but also serves as the infrastructure for commercial transactions. For India to fully capitalize on the opportunity and sustain paralleled growth in the global IT-ITeS market and in the IT sector in general, stakeholders need to continue working towards timely and coherent execution of initiatives to address supply-side concerns across the following areas, as well as more generally to improve basic infrastructure in transport and utilities:

- **Improving the Supply of Quality Human Capital**

  Human resource development (HDR) is the key area in supplying quality skilled workers for global and local markets. In recent years, various initiatives have been introduced to restructure educational institutions as discussed above. Many states establish Indian Institutes of Information Technology (IITs) as centres of excellence. There is a shortage of employable labour in the IT sector. In most companies, around 80% of recruitment is made at the entry level and 80% of total training budget is spent on these employees.[36] Changing school; university curriculum; providing incentives to academics; promoting industry-academia partnerships; introducing 'bridge course' for managers; expanding capacity of world class institutions (e.g., IITs, IIMs and IISc)[37] are amongst such initiatives in recent years.

- **Creating World-Class Infrastructure and Bridging Digital Divide**

  Major cities (Tier I/II cities are Bangalore, Mumbai, Delhi, Pune etc.) are already witnessing signs of strain. Tier III/IV cities (such as Mysore, Manglore, Nagpur, Indore, Bhubneshwar and Kolkata) need development of adequate infrastructure with modern facilities (transport, particularly roads, and utilities). Public-private partnerships have been initiated. Investment in increasing number of engineering colleges, housing, transport facilities are underway. Connectivity in rural areas needs improvement. Initiatives in recent years need expansion.

[36] NASSCOM-Deloitte Study (2008).

[37] IIM: Indian Institute of Management; IISc: Indian Institute of Science.

- **Providing Regulatory Support**

  The cost of doing business is a major factor for offshore sourcing of IT-ITeS. In recent times, due to wage inflation both Indian and foreign firms are seeking alternative countries. Investment rules and the legal framework are needed to be simplified.

- **Promoting Hardware/ Electronics Sector for Domestic Demand and Export**

  Grants of SEZ status, high consumer demand for electronic goods and favourable FDI flows have started building the hardware sector for the international market in recent times. Domestic hardware market is still tight, the largest market still comprises their collaborators aboard: Unisys for TUL, ICL for ICIM, Sun and other technical collaborators for WIPRO Infotech, Hewlett-Packard for HCL-HP. Consumer Electronics is the driver for this segment. Increasing production of finished and intermediate components will help in reducing the trade deficit in hardware segment.

- **Fostering Innovation**

  Indian industrialization has been heavily depended on imported technology and on technical collaboration agreements. Technology transfer stimulates rather than replaces, domestic R&D in case of India. India needs to transform gradually from the 'back-office of the world' to the 'front-office of the world' through innovation. With increasing IT adoption in India, consumers should have access to affordable, relevant products and solutions. Domestic R&D gets commercialised to consumer products. Domestic based technology enables solutions to many social development issues in education, health care, poverty reduction at a fraction of the cost of imported technology.

  The NASSCOM with the help of various state governments is actively encouraging linkages between technology industries, academia and research institutions in promoting research and innovation. Lack of knowledge about patent regimes, inability to take risks and lack of awareness of detailed domain knowledge were hindering software companies in promoting innovation. Strengthening patent rules, simplifying procedures and reducing the cost of patenting would help the innovation environment.

- **Policy Suggestions**

  The Indian IT sector plays a major role in the global market. The strength of the sector lies in the availability of skilled labour, early initiatives taken by the central and several state governments in promoting IT services in export markets and mass demand generated from the domestic sector itself. The hardware and electronics segment was in an embryonic stage for many years, albeit has started picking up in recent times. The policy suggestions that follow identify priority actions that would assist India in maintaining growth in the IT sector (they are also laid out in Annex A2, following the format of national policy peer reviews):

  – *Policy prioritisation:* Many initiatives have been taken at various levels. Prioritisation of the policy agenda is needed in defining the roles of government and other public sectors along with the private sector. Monitoring performance and keeping timelines is important in this respect. Promoting electronics production for both the domestic and export sector should be in priority.

- *Rural awareness:* To increase IT awareness in rural areas, the Indian government needs to increase the funding of major projects including introducing cyber cafés, software and internet web-sites in Indian languages at wider level. Connectivity in rural areas needs improvement. Initiatives such as Media Lab Asia (a collaboration of the Department of Information and Technology (DIT) with the Massachusetts Institute of Technology) are helping villages in the areas of education, training, healthcare, agriculture etc using broadband. This kind of program should be introduced in every state.

- *R&D spending:* Further efforts are needed to foster business sector R&D. 'Lab to market' process i.e., commercialisation of technology is necessary. Contributions of both public and private sector R&D should be increased. Further supplies of venture capital are needed both in IT services and hardware. Particularly, in the hardware segment, fast obsolescence, a weak R&D base and poor basic infrastructure (transport and utilities) have resulted in very low investment recently.

- *ICT skills:* To create more manpower and retain people in the IT sector, government and other bodies should continue to constantly update curriculum in schools, colleges and universities, whilst offering higher salaries to research professionals. Academia-industry partnerships should be promoted more extensively.

- *Content creation:* Development of web-sites in desirable both for public and private businesses (maps, archives, products, prices, staff and contact persons). Currently, data availability in the public domain is very poor. Public and private officials need to become more active in reading and responding to emails.

- *Importance of Small and Medium Enterprises (SMEs):* Providing SMEs fiscal incentives so that they can compete with multinationals in export markets.

- *Standard, trust and security:* Introduction of policies to deal with cyber crimes. Laws need to be introduced for electronic payments and internet based businesses.

- *Evaluation:* Information at various levels is not transparent or easily accessible. Development of web-sites with company details, availability of data in the public domain and introduction of digital signatures are needed to run businesses more effectively.

9.2. General Remarks

71. India has been one of the fastest growing world economies in recent years. Indian IT and ITeS offers high quality product and services with state-of-the-art technology. Indian ICT companies are held in high repute world-wide. The contribution of the Indian IT and ITeS segment to national GDP has increased from 1.2% to 5.4% between 1999-2000 and 2006-07. Almost all major Indian software companies have obtained the International Standards Organisation 9000 (ISO 9000) certification.[38] 80 out of the world's 117 SEI CMM Level 5 (Software Engineering Institute, Capability Maturity Model of the United States) companies are from India.[39] Global ICT leaders such as Dell, Microsoft, IBM, Oracle, Ericsson, Unisys, Motorola, HP, Texas, Fujitsu, Siemens, and Bosch have invested in India. In recent past, a rising rupee

38 NASSCOM (2004)

39 The Software Engineering Institute was established in 1984 at Pittsburgh, USA. They have developed the CMM Model for software in describing key element of an effective software process. It includes five maturity levels, each representing a different component in the development of software process.

with spiralling salaries, due to a shortage of IT professionals, has affected this sector. Some of the leading Indian IT companies are, therefore, acquiring businesses or setting up development centres/back-offices in countries such as Mexico, the Philippines, Thailand, and Eastern and Northern European countries such as Hungary, the Czech Republic, Slovakia, and Northern Ireland. English-speaking skilled manpower is available in these countries sometimes at half the wage rate in India.

72. Finally, how is the Indian IT sector performing in the current global crisis? This will no doubt lead to downward revisions of revenue projections and other statistics for major Indian and multinational firms due to recession in the developed world. However, it is suggested that the effects will be less profound in the case of India due to growing domestic demand, weaker currency in recent years and relatively good management of macroeconomic policies by the current government. In the following two sections, we try to sketch some implications of current global credit crunch on Indian IT sector.

9.3. Current Global Downturn and Indian IT Sector

73. Global financial market downturn has direct and indirect effects on Indian IT sector. Our analysis and review so far in this report is based on pre-downturn period. During our writing-up period, situation has changed in India. We would like to highlight some of these changes within the IT sector in this section and implications to the industry at the midst of this crisis period.

74. Any sector based on mainly outsourcing is not recession proof. Indian IT sector is no exception. Outsourcing has been considered as a source of scale economies to support growth, consolidation and globalization. In recent times, India has been losing its position as one of the most important offshoring destinations, China, Morocco and Hungary are coming up. Competitive labor market in India is driving companies out to alternative destinations. Top 20 UK IT services suppliers opened 21centers since January 2007, only 2 were in India. Indian dominance in IT outsourcing in long-run has been questioned in recent time mainly due to heated labor market. The situation has improved due to weaker currency in the second half of 2008. However, in a recent survey by the Gartner, out of 72 countries as offshore destination, India and China continue to be the leaders of outsourcing services.

75. The long-term impact of economic crisis is hard to predict at this stage. But the collapse of some of the largest clients in the developed world has reduced the prospects of the leading outsourcers at least in the short run. Also the firms with large investment portfolios directly or indirectly exposed to subprime lending for example AIG, will be cautious on new initiatives and projects, indirectly affecting the revenue of Indian firms which service them. Fear of recession and conservatism will bring down the growth of IT sector in the short run.

76. In domestic market, global downturn in the short run is forcing companies to reduce hiring, postpone new investment and freeze salaries. On the positive side, attrition rate has declined, productivity has increased. Due to lack of demand, average increase in wage bill for this sector has halved, to around 10% a year.

77. Global crisis may increase outsourcing in the long run as western companies will seek cost cutting measures. Recent credit crunch will force businesses to reconsider their core activities and outsource others where they do not have competitive advantage. Other than financial sector, tourism, healthcare, infrastructure and energy are increasingly using IT and need to be outsourced. Mergers and acquisitions in financial sector during and after financial crisis will need technical expertise to integrate disparate systems; also stricter regulatory compliance will increase outsourcing opportunities. Nevertheless, NASSCOM has released revenue growth of IT-BPO industry as 28 %, with combined

revenue of $52 billion in 2007-08. The revenue growth for the sector in 2008-09 is projected between 21% and 24%.[40]

9.4. The Role of the Indian IT Services Industry in the Long-term

78. IT sector is the major exporting sector and a beacon for the country and employer of more than 2 million people. Recent economic downturn in developed world has caused wages and revenue of this sector to fall significantly in the short run, in the long run situation needs to be changed. India has become global front office, handling customer service calls, and back office, helping to process payments and run accounting and other computer systems. Current 'lift and shift' model for western companies will not work in long-run. India needs to become one of the head offices –innovating new products, techniques or shaping major corporate strategies. India needs to be known in future global market not as a source of 'cost-arbitrage' but as a provider of value added services in this changing environment.

79. Current crisis originated from failure of the regulatory systems, lack of transparency and visibility within financial institutions in developed world. A substantial IT investment is necessary for a massive overhaul of initially the financial sector and the spill-over effects into other sectors. Better governance and management needs increase in transformation budgets. So far, emphasis was given in maintaining the system without much transformation. Indian companies (with local firms) can build this expertise to reap the benefits from this transformation. Indian firms are already facing these challenges and changing their behaviour. Diversifying market outside the US and Europe, investing in training/human resources, research and consulting which can add higher value services, tightening recruitment policy , improving productivity and utilization levels will help to meet the challenges in future to remain competitive in global market. Recent trends during downturn resulted in following changes to note in Indian IT sector with future possibilities:

- The global financial crisis sparked a capital flight, more than $10 billion in Indian equities repatriated. A few fraud incidences by Indian firms in recent times have also triggered loss of investors' confidence with Indian market. For example, the Wipro technology, a unit of Wipro limited had been banned in June 2007 by the World Bank for four years for "providing improper benefits to bank staff". On top of this, announcement of financial irregularities in early January, 2009 from Satyam might further blow investors' sentiment away from the Indian market. Prompt actions are taken by the government at various levels to restore confidence in the market.

- Currency fluctuation has resulted in improving efficiency for firms. It has improved productivity of employees. It has reduced attrition rate and salary inflation. It is expected that India will continue to supply global human resources as it produces one third of world younger working population (15-29). According to Goldman Sachs, June 2008 paper India will create the equivalent of the combined working population of France, Germany, Italy and the U.K. by 2020. Increased outsourcing opportunities will be associated with more job creation in emerging markets.

- Moreover, economic slump may increase outsourcing opportunities in the long term as overseas companies will seek better utilization of resources in competitive market.

[40] Source: NASSCOM, Annual Survey 2008, http://www.nasscom.in/Nasscom/templetes/

ANNEX

A.1. MAJOR COMPANIES

The following sub-sections present a brief review of the major domestic firms and existing multinationals in India.

Tata Consulting Services Ltd: Established in 1968 as a Division of Tata Sons, the TCS was a pioneer as the leading IT company and continues to maintain it's pre-eminence in India. In the 2006-07, total income increased by 34.2 % compared to the previous year. Net profit was 24.8% of total income. The company has 148 offices globally. Additionally, there are many delivery centres outside India with major ones in Hungary, Brazil, Chile, Uruguay and China. The USA continued to be the largest market; contributing 52.4% of the consolidated revenue, whilst the UK and Europe together contributed 28.5%. The company has recently expanded in emerging markets including Latin America and the Asia Pacific region. The company made acquisitions/alliances in Switzerland, Australia and China in 2006. In the same year it was recognised in various forums including.

- Ranked among the Top 10 US application management services vendors
- Company of the year-2006 from the Economic Times
- Top position in 'Top 10 Best Performing IT Services providers' category in the 2007 Global Services Listing.[41]

***Infosys Technologies Ltd*:** Established in 1981, is the first Indian firm listed on the NASDAQ, in 1999. It was the first to benchmark its organisational practices to global standards. The company develops, installs and services software on a fixed-price turnkey project basis. In 2005-06, growth in revenues was 33.5 % and growth in earnings was 30.9 %. Revenue from software exports was Rs 8,864 crores, increased by 31.8% in 2006-07. 65.58 % of revenues earned from North America, 24.22 % from Europe, and 8.4 % the rest of the world. The gross profit amounted to Rs. 4.141crores (45.9% of revenue).[42] The company has four subsidiaries in Australia (Melbourne), China (Shanghai), USA (Texas) and Progeon S.R.O. (Progeon Limited) in India. It also has operations in Europe, Japan and Africa. Infosys pioneered the Global Delivery Model (GDM), which is used in distribution and management across multi global locations. In 2005-06, the company ranked No. 10 in the annual Business Week InfoTech100, and has also achieved high maturity, which has been systematically benchmarked against world-class operating models.

***Wipro Ltd*:** This company commenced operations in 1946 as a Vanaspati oil manufacturer and entered the IT sector in 1980. In 2007, revenues grew by 41% to Rs 149,982 million and profit after tax grew by 42% to Rs 29,421 million. The company now has 50 subsidiaries in 29 countries and is listed on the New York Stock Exchange (NYSE). R&D efforts contributed nearly 8.5% of total revenues in 2005-06. In India, the Middle East and the Asia Pacific Wipro Infotech manufactures personal computers (PCs). The market for desktops grew by 21% to 4 million units, while the growth of laptops was 167% to 0.6 million in 2006.[43] This segment is the leading strategic partner for the companies across the regions-providing IT solutions.

41 TCS, Annual Report, 2006-07.

42 Infosys, Annual Report, 2005-06.

43 Wipro, Annual Report, 2005-06.

Wipro technologies (NYSE: WIT) section operates in a global context, providing IT consulting and software services.

In a recent annual survey by NASSCOM (January, 2009), TCS revenues went up 22% in 2007-08; for Infosys and Wipro figures were 35% and 23% respectively.

***Satyam Computer Services Limited*:** The company was incorporated in 1987. Software development and maintenance, consulting and enterprise business solutions, extended engineering solutions and infrastructure management services are major categories amongst other services. The company is listed on the NYSE. Total income increased to Rs 5,012.22 crores in 2005-06, an increase of 41.3% compared to the previous year. The IT services segment contributed an increase in revenue of 33.8% to Rs 3,464.22 between 2004-05 and 2005-06.[44] 65.6% of this revenue is from North America and 18.2% from Europe. Satyam has subsidiaries in China, USA, Singapore, UK and Malaysia. Satyam has 53,000 employees with operations in 66 countries. Recent fraud revelations by the former chairman B. Ramalinga Raju has already impacted the company and in particular damaging confidence of investors on corporate India. More than 70 billion (1 billion pounds) had been deceitfully booked on the company accounts. News of this scandal (which is termed as 'Enron moment in India') spread jitters through Indian stock market, and the benchmark 'Sensex index' fell more than 5 percent. Shares in Satyam fell more than 70 percent.[45]The role of external auditor, board and independent directors are under detailed scrutiny. Indian government with newly appointed board is acting promptly to get the bottom of the fraud and determined to restore confidence of investors.

Other major software/services exporting Indian companies are HCL Technologies, Patni Computer Systems, I-flex Solutions, Tech Mahindra, Perot Systems TSI (I) Ltd, L&T Infotech, Polaris Software Lab, Hexaware Technologies, Mastek, Mphasis BFL, Siemens Information Systems, Genpact.

Multinational Companies in India

The first US ICT multinational company to enter India was Texas Instruments, in 1988. Until the early 1990s, MNCs relied on interim IT service contractors in India, known as 'body shopping'. Today, however, a major part of this work is being done in India rather than at client sites. Now more than 500 major international companies have IT operations in Bangalore alone. Major IT MNCs, IBM and Oracle have Indian development centres as part of all global application development projects - for example IBM has 6 such centres. Electronic Data Systems and Computer Sciences Corporation have also substantially increased their presence. Other major MNCs with Indian subsidiaries that export IT services include Microsoft, Hughes, Hewlett-Packard, Siemens, Lenovo, Nortel, Motorola, Intel, i2 and Cisco.

Besides this, an increasing number of Indian companies are expanding their horizons in overseas markets. China is the top priority, for example, for Infosys and TCS recently. Wipro's Japanese and Chinese centres focus on language specific jobs, Eastern European centres handle BPO operations whilst French and Brazilian centres provide embedded software design.

44 Satyam, Annual Report, 2005-06.

45 Flooyd Norris: A Corporate Hero Admits Fraud (January 7,2009).

A.2. POLICY RECOMMENDATIONS

Policy domain	Current priority	This priority should be	Suggested recommendations
Co-ordination of initiatives	High	Continued	Current and recent past strategies are well-articulated, but the implementation process is somewhat slow, regional initiatives should be promoted to bridge the digital divide.
Infrastructure	Low to Medium	Increased	Connectivity in rural areas needs improvement. Telecom infrastructure is adequate. Initiative like Media Lab Asia (a collaboration of the Department of Information and Technology (DIT) with the Massachusetts Institute of Technology) are helping villages in the areas of education, training, healthcare, agriculture etc using broadband. This kind of program should be introduced in every state.
R&D and Innovation	Low	Increased	R&D expenditure is well below that of many countries. Increases in industry-academia partnerships and public-private partnerships are needed.
ICT skills	High	Continued	Changes in curriculum are occurring, should be continued. Retaining skilled workers with high salaries is necessary.
Content creation	Low to medium	Increased	Enhance availability of public sector content, wider access of Indian language based software and operating system INDIX.[46]
Small and medium sized (SMEs) firms	Low to Medium	Increased	There is scope of improvements for SMEs
Standards, trust and security	Low to Medium	Increased	Different initiatives have been taken by government and NASSCOM, continued implementation is necessary.
Evaluation	High	Continued	Companies have good reputations in domestic and world markets. Access to economic and programme data in the public domain is necessary in evaluating performance by academics and industry partners.

[46] INDIX operating system enables Indian languages to be available freely in using information technology for various social purposes.

REFERENCES

Britannica Yearbook, various years.

Dossani, R. (2006), 'Origins and Growth of the Software Industry in India', Asia-Pacific Research Center, Stanford University, USA.

Evalueserve, 'Semiconductors: Market and Opportunities'.

Global Information Technology Report (2006), World Economic Forum, Geneva.

Government of India, 'FDI Data Cell', Ministry of Commerce, New Delhi, India.

Government of India, 'Eleventh Five Year Plan, 2007-12, Department of Information Technology, Ministry of Communications and Information Technology', New Delhi, India.

Government of India, 'Statistical Year Book 2005-06', Electronics and Computer Software Export Promotion Council, Department of Commerce, New Delhi, India.

Heeks, R. (1996),'India's Software Industry: State Policy, Liberalization and Industrial Development', New Delhi: Sage Publications, and London: Thousand Oaks.

IMD (International Institute of Management Development, Switzerland),World Competitiveness Year Book, 2006 at http://www.imd.ch/research/publications/wcy/

Kumar, N. and K.J. Joseph (2005),'Export of Software and Business Process Outsourcing from Developing Countries: Lessons from the Indian Experience,' Asia Pacific Trade and Investment Review, Volume 1, No.1, April 2005

Mathur, Somesh K. (2007a), Perspective of Economic Growth and Convergence in Selected South Asian and East Asian Economies, E-Book published by ideaindia.com(www.ideaindia.com), London.

Mathur, Somesh K. (2007b) Indian IT and ICT Industry: A Performance Analysis Using Data Envelopment Analysis and Malmquist Index', Global Economy Journal, 7, No 2, pp 1-40.

Ministry of Communications and Information Technology, Govt of India, Document on Eleventh Five Year Plan, 2007-12, Department of IT. (web-site: http://planningcommission.nic.in/plans/planrel/11thf.htm)

National Association of Software and Service Companies (NASSCOM), 2004, 'The IT software and services industry in India: strategic review 2004', NASSCOM, New Delhi, India. http://www.nasscom.in/Nasscom/

NASSCOM, IT Industry Fact sheet, February, 2006

NASSCOM, IT Industry Fact sheet, August 2006

NASSCOM, Knowledge Professionals Fact sheet (2006)

NASSCOM, Fact sheet, February, 2007

NASSCOM (July, 2007)

NASSCOM, IT Industry Fact sheet, August 2007

NASSCOM, ITeS-BPO Fact sheet, August 2007

NASSCOM (2007), Annual Report

NASSCOM-Deloitte (2008)

National Council of Applied Economic Research (NCAER), India: E-Readiness Assessment Report, 2005

NCAER, Working Paper, May, 2006.

OECD (2000), (2006), OECD Information Technology Outlook, Paris, France.

OECD (2007), Patent Database, Paris, France.

OECD (2007), Economic Surveys of India, Paris, France.

Statistical Year Book 2005-06, Electronics and Computer Software Export Promotion Council, Govt. of India.

Yearbook of World Electronics Data 2008/2009 Volume 3 – Emerging Countries & World Summary, Reed Electronics Research at www.rer.co.uk

Schwere, R. (1987), 'Software Industry in the Third World: Policy Guidelines, Institutional Options and Constraints', World Development, 15 (10/11), 1249-67.

Schwere, R. (1992),'Software Entry Strategies for Developing Countries', World Development, 20(2), 143-64.

Sen.P (1995),'Indian Software Exports: An Assessment', Economic and Political Weekly, volume 30, No 7& 8, pp 2053-2058.

World Competitiveness Yearbook, 2001, IMD.

WITSA (World Information Technology and Services Alliance) at www.witsa.org/

REPORTS

Infosys Technologies Ltd, Annual Report, 2005-06.

Satyam Computer Services Limited, Annual Report, 2005-06.

Tata Consulting Services Ltd (TCS), Annual Report, 2006-07.

Wipro Ltd, Annual Report, 2005-06.

Report on 'ICT Industry in India', the Indo-Italian Chamber of Commerce and Industry, November 2006.

Report published by the Electronics and Computer Software Export Promotion Council (ESC), Department of Commerce, Government of India, 2003.

WEB-SITE ADDRESSES

Indian Brand Equity Foundation (IBEF), accessed September 29, 2007.-http://www.ibef.org/

http://australianit.news.com.au/story/, accessed June 21, 2007

www.nationalskillsregistry.in

http://ncert.nic.in/

www.weforum.org/en/