

PROMOTING DIRECTIONAL MOVE AND FACTOR INPUTS: THE CASE OF INDIAN SOFTWARE INDUSTRY

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Abstract: *A number of new development perspectives and concerns have emerged in the Indian software market due to the ongoing reforms as well as the competitive strategies and innovations. About seventy percent of the Information Technology (IT) market has depended on software that has signaled the immense strength of the software sector as a driver of the overall IT industry and has included the vertical as well as the horizontal software market. The software industry not only includes the business involved in the development, maintenance and publication of computer software but also software services, such as training, documentation and consultation. This paper has concentrated on understanding the evolving dimensions of the Indian software market so that a directional future can be attained. Section 1 is an introductory analysis dealing with the framework of the software market in India. Section 2 of the paper deals with a study done on software firms in the city of Mumbai. Section 3 is based on the segmentation of the software market. Section 4 is an analysis on the role and the performance of two main factor inputs needed for the functioning of this market. Section 5 highlights the competitors for the software industry to provide an idea of the status of the Indian software industry in the global scenario. The concluding section provides a directional move for the Indian software market through the linkage effect.*

Keywords: *Information technology, Software, Factor input, Linkage.*

1. INTRODUCTION

The framework of the Indian software market is based on the terminologies identified with software production. 'Software' is defined as a set of programs that forms a configuration that deals with data as well as work products; has been the interface between computers and human commands that is translated into the system of human logic using a set of electromagnetic impulses. Software when analysed as an economic product in terms of its uses can be better understood from Schwabe's (1992) classification of use and users of software wherein, use-wise software can be broadly categorised into system software and application software. The software market in the opinion of Bhatnagar and Jain (1991) has

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been generally divided into the following segments that have included packaged software, customised application software and system integration. In this paper, focus has been on packaged and customised application software or software services that together have accounted for 60 percent of the total market since the 1990s.

IT as an instrument of development will depend critically on the extent to which it can make a positive impact on the welfare of the poorest in the country. The sectoral system of innovation in the IT sector of India can be characterised by the early development of a system of higher education in engineering disciplines, creation of an institutional infrastructure for science and technology policy-making and implementation, investments in public-funded research and development (R&D) institutes and a unique socio-cultural environment that supports the sustainability of these elements of the innovation system (Dolly Sunny 2010, p.197). In order to achieve innovation in the IT sector, one area would be to focus on the development of the software market.

1a. Framework of Indian Software Market

As noted in Table 1, the share of software packages has been initially quite low at 8.1 percent, has increased thereafter, underwent ups and downs but finally, has declined drastically to 9.2 percent in 1999-2000, 8.0 percent in 2000-01 and have accounted for less than one third of the total in 2000 indicating that it has been confined only to the top players or certain select producer groups. India's lack of concentration on packaged software has been attributed to her unfamiliarity with the recent market trends and the environment in the United States (U.S.) and Europe; the differences in the computer systems that have presented impediments; the severe competition in the software industry with high costs in marketing and promotion that have made it difficult to compete effectively. Among the various components of domestic software as put forward by Radhakrishnan (2003), the percentage share of products and of packages in the domestic sector has been high, about 79 percent, as against 21 percent in exports during the year 2000-01. Indian software exports have been dominated by the export of software services, in the form of custom software work and the percentage share of the services component was 91.9 percent in 1989-90, 92 percent in 2000-01 for there have been ups and downs in the value of services production, but it has never declined below 75 percent.

Identifying the industries served by Indian software exporters, it can be noted from Table 2 that Indian exporters have served a wide range of areas with a high proportion of firms having concentrated on banking, retail and manufacturing followed by multimedia, medical, education and government. It may be stated that the basic infrastructure required for software production, namely, stable electricity and good communication were available only in some regions. The

Table 1
Software Industry-Packages versus Services (1989-2001)

<i>Year</i>	<i>Total Packages Software Value (In Rs. crore)</i>	<i>Total Packages Software (In Percent Share)</i>	<i>Total Services Value (In Rs. crore)</i>	<i>Total Services (In Percent Share)</i>
1989-90	21	8.1	236	91.9
1990-91	94	22.2	329	77.8
1991-92	144	20.0	578	80.0
1992-93	185	17.1	895	82.9
1993-94	261	17.2	1,253	82.8
1994-95	457	19.5	1,890	80.5
1995-96	912	25.2	2,713	74.8
1996-97	1,089	20.8	4,141	79.2
1997-98	2,255	23.2	7,478	76.8
1998-99	2,440	16.5	12,373	83.5
1999-00	1,838	9.2	18,116	90.8
2000-01	2,464	8.0	28,270	92.0
Growth Rate 1989-90 to 2000-01 (In Percent)	50.29	-	54.67	-

Source: Radhakrishnan K.G. (2003) "India's Software Industry: A Structural Break-Up" in Journal of Indian School of Political Economy, July -September, Vol. 15 No. 3, pp. 690.

Bombay-Pune region was particularly favoured for its stable electricity and the first export-processing zone. Bangalore has several space and electronic research laboratories that was another favoured location. Delhi was also a favoured location, possibly due to its proximity to the central government (Arora and Gambardella 2005, p.23).

Table 2
Industries Served by Indian Software Exporters

<i>Domain Area</i>	<i>Number of Firms</i>	<i>Percentage of Firms</i>
Banking	45	50.0
Medical	23	25.6
Retail, Warehousing	47	52.2
Multimedia and Entertainment	27	30.0
Education	23	25.6
Travel and Tourism	16	17.8
Manufacturing	46	51.1
Government Related	22	24.4
Transport	27	30.0

Source: Roy Sumit (2005) "Globalisation, ICT and Developing Nations: Challenges in the Information Age", Sage Publications India Pvt. Ltd., New Delhi, pp. 152.

2. DATA AND RESEARCH METHODOLOGY

The research is mainly based on primary data collection that has been conducted with reference to a study on software firms in Mumbai city. Through this study of 114 software firms from the areas of Central and South Mumbai, Western Suburbs and Navi Mumbai, various analysis and interpretations have been drawn. In this study, firms had to identify the various drivers that will enhance the productivity of the software firms. One such driver was innovation and it can be noted that the findings in the study indicate that organisations in order to compete and survive in the competitive market place must constantly innovate in their development for software products and services. This analysis is important to understand the need for R&D in the software industry that in turn will lead to the correlational existence between innovation and entrepreneurship.

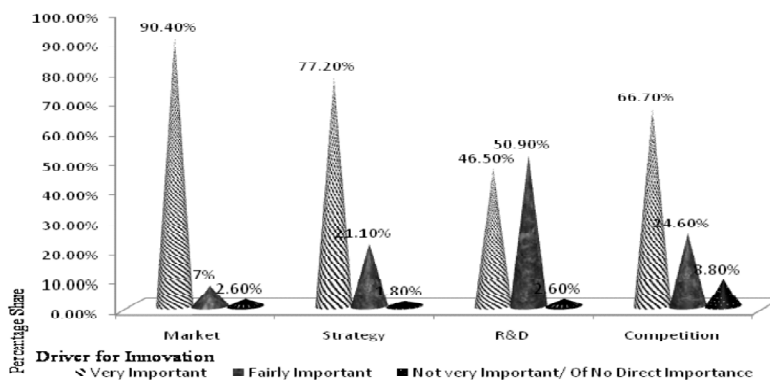
2a. Innovation: An assessment of the driver for innovation in the surveyed firms is based on Table 3 and Figure 1.

Table 3
Driver for Innovation in Surveyed Software Firms (2008-2009)

Classification	Very Important (In Percent)	Fairly Important (In Percent)	Not very Important/ of No Direct Importance (In Percent)	Number of Firms
Market	90.4	7.0	2.6	114
Strategy	77.2	21.1	1.8	114
Research and Development	46.5	50.9	2.6	114
Competition	66.7	24.6	8.8	114

Source: Compilation of Survey Results conducted in the year 2010.

Figure 1: Driver for Innovation in Surveyed Firms (2008-2009)



Source: Derived from Table 3.

Table 4
Assessment of Advantages in Mumbai by Software Firms (2008-2009)

Characteristics	Region			Total
	Central and South Mumbai	Navi Mumbai	Western Mumbai	
<i>Work Ethics and Reflection in the Rate of Employee Turnover:</i>				
Excellent	44.7	66.7	50.0	49.1 (56)
Good	46.8	22.2	46.6	44.7 (51)
Average/Unsatisfactory	8.5	11.1	3.4	6.1 (7)
<i>Commitment of Staff:</i>				
Excellent	27.7	33.3	39.7	34.2 (39)
Good	66.0	66.7	56.9	61.4 (70)
Average/Unsatisfactory	6.4	—	3.4	4.4 (5)
<i>Benefit from a Higher Proportion of Experience Personnel:</i>				
Excellent	12.8	-	13.8	12.3 (14)
Good	78.7	100.0	82.8	82.5 (94)
Average/Unsatisfactory	8.5	-	3.4	5.3 (6)
<i>Lower Annual Training Cost:</i>				
Excellent	12.8	33.3	32.8	24.6 (28)
Good	70.2	55.6	50.0	58.8 (67)
Average/Unsatisfactory	17.0	11.1	17.2	16.7 (19)
<i>Highly Efficient and Cost Effective, Worldwide Communications Infrastructure using State of the Art Technology:</i>				
Excellent	27.7	22.2	25.9	26.3 (30)
Good	66.0	66.7	62.1	64.0 (73)
Average/Unsatisfactory	6.4	11.1	12.1	9.6 (11)
<i>Proximity to Customers:</i>				
Excellent	19.1	22.2	24.1	21.9 (25)
Good	78.7	77.8	70.7	74.6 (85)
Average/Unsatisfactory	2.1	—	5.2	3.5 (4)
Total	100 (27)	100 (9)	100 (78)	100 (114)

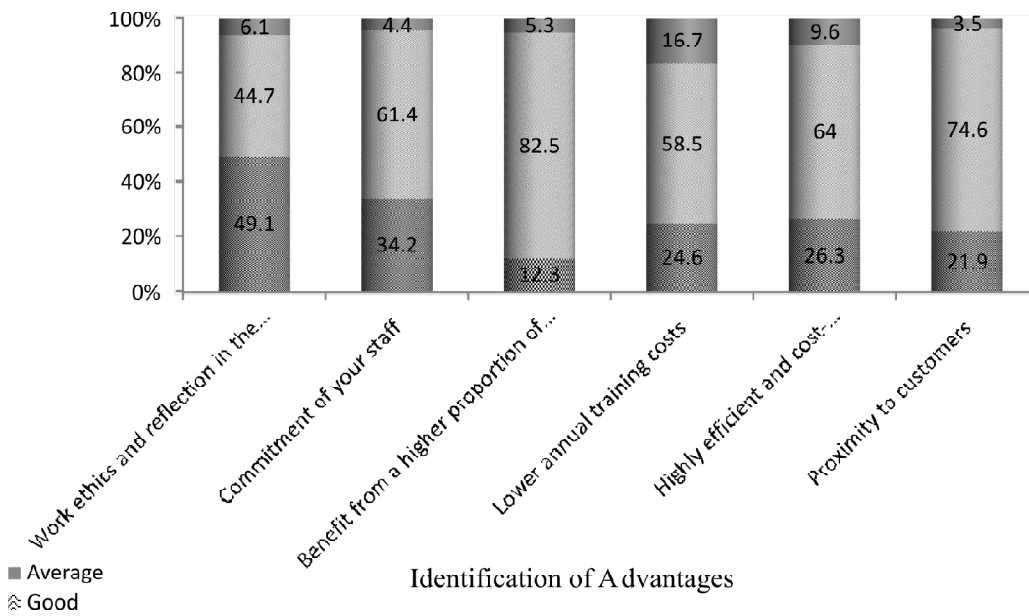
Note: Figures in parentheses indicate number of firms.

Source: Compilation of Survey Results conducted in the year 2010.

It can be noted that lack of investment in research and development activity by the firms has resulted in lack of innovational software by most firms. Most of the firms in the study have rated market and strategy as the very important drivers required. Findings from the study has identified that significant constraints have dominated the domestic software sector market that have included the problems of building credibility, product quality and security, difficulty and cost of

marketing, lack of available skills, capital and technology, small size and poor quality of demand. This could be one reason for the lack of adequate R&D facilities. Firms were also asked to identify the advantages and impediments to evaluate the need for innovation and the use of entrepreneurship as revealed in Tables 4 and 5 and Figure 2.

Figure 2: Advantages Revealed by Surveyed Software Firms (2008-2009)



Source: Derived from Table 4.

**Table 5(a)
Assessment of Impediments Revealed by Software Firms (2008-2009)**

Characteristics	Very Important (In Percent)	Important (In Percent)	Neutral/ Unimportant /Very Unimportant (In Percent)	Not Applicable (In Percent)	Number of Firms
Problems in Export Market	22.8	33.3	6.1	37.7	114
Problems in Domestic Market	27.2	55.3	14.0	3.5	114
Manpower Shortage/Skills	21.1	57.0	18.4	3.5	114
Employee Attrition	14.9	46.5	33.3	5.3	114
Labor Cost	24.6	44.7	28.1	2.6	114
Labor Productivity	20.2	58.8	16.7	4.4	114
Physical Infrastructure*	15.8	53.5	27.2	3.5	114

contd. table 5

Characteristics	Very Important (In Percent)	Important (In Percent)	Neutral/ Unimportant /Very Unimportant (In Percent)	Not Applicable (In Percent)	Number of Firms
Commercial Infrastructure**	22.8	53.5	21.1	2.6	114
Quality Certification	21.9	48.2	25.4	4.4	114
Visas	11.4	24.6	29.8	34.2	114
Finance /Capital	12.3	53.5	29.8	4.4	114
Capital Investment	15.8	54.4	25.4	4.4	114
Marketing Access	17.5	42.1	35.1	5.3	114
Communication	19.3	47.4	29.8	3.5	114
Lack of Domestic Computerisation	8.8	50.0	38.6	2.6	114
Lack of Government Support	11.4	50.0	35.1	3.5	114
Tariffs and other Barriers	14.0	54.4	27.2	4.4	114

Note: *Electric Supply, Water, Land, Transportation,**Telephone Lines, Internet Connectivity, Data Networks.

Source: Compilation of Survey Results conducted in the year 2010.

Based on the region-wise locational aspect, it can be noted from Table 4 and Figure 2 that maximum representation is allotted to the benefit from a higher proportion of experienced personnel, followed by proximity to customers, highly efficient and cost-effective world-wide communications and commitment of staff. With reference to the impediments faced by the firms from the administrative and labour perspective represented in Table 5, the availability of human resources, lack of available skills and labour productivity have been perceived by most firms in the city of Mumbai as the greatest impediment. Labour productivity followed by problems in the domestic market are also been rated as important.

3. SEGMENTATION OF SOFTWARE MARKET

Software development in application software has been categorised by Heeks (1996) and Kumar (1987) into two broad divisions, namely, generic software products as goods or the horizontal software market and custom software as a service or the vertical software market. A vertical software market is one that supplies goods to a specific industry and in this market software is developed for niche applications or for a specific clientele, in the case of investment, real estate and banking programs. A horizontal software market is one that can be used by multiple industries, for example, word processing and spreadsheet programs. There is typically less competition in vertical markets but it can still be a risky industry since developers are highly dependent on specific clients to buy their products. As stated by Ministry of Communications and Information Technology (2010), among the verticals serviced by India's information technology (IT)-IT

Table 5(b)
Assessment of Administrative Perspective Impediments (2008-2009)

Characteristics	Region (In Percent)			Total
	Central and South Mumbai	Navi Mumbai	Western Mumbai	
Availability of Human Resource:				
Yes	63.8	77.8	56.9	61.4 (70)
No	36.2	22.2	43.1	38.6 (44)
Productivity versus Number of Employees:				
Yes	21.3	11.1	20.7	20.2 (23)
No	78.7	88.9	79.3	79.8 (91)
Difficulty and Cost on Marketing:				
Yes	21.3	22.2	25.9	23.7 (27)
No	78.7	77.8	74.1	76.3 (87)
Problems of Building Credibility:				
Yes	2.1	11.1	13.8	8.8 (10)
No	97.9	88.9	86.2	91.2 (104)
Product Quality and Trust:				
Yes	31.9	-	17.2	21.9 (25)
No	68.1	100.0	82.8	78.1 (89)
Use of Capital and Technology:				
Yes	19.1	-	13.8	14.9 (17)
No	80.9	100.0	86.2	85.1 (97)
Competition from Foreign Firms:				
Yes	21.3	44.4	32.8	28.9 (33)
No	78.7	55.6	67.2	71.1 (81)
Small size and Poor Quality of Demand from Domestic Market:				
Yes	6.4	-	5.2	5.3 (6)
No	93.6	100.0	94.8	94.7 (108)
Total	100.0 (27)	100.0 (9)	100.0 (78)	100 (114)

Note: Figures in parentheses indicate number of firms.

Source: Compilation of Survey Results conducted in the year 2010.

enabled Services (ITES)-business process outsourcing (BPO) industry those that account for the largest share of revenue are banking, financial services and insurance (BFSI) with 41 percent, Hi-Tech/ Telecom with 20 percent, manufacturing with 17 percent, retail with 8 percent, with smaller contributions coming from media, publishing and entertainment, construction and utilities, healthcare and airlines and transportation. Important industry verticals being serviced by the BPO segment are insurance, retail banking, travel and hospitality, auto manufacturing, telecom and pharmaceuticals. Horizontals such as Customer Interaction and Support (CIS), Finance and Accounting (F&A) and Human Resource Management (HRM) are important areas in the BPO segment. A segmentation of the Indian software market is carried out from the perspective of the contribution and contribution of domestic and export software as well as the global IT services market and the Indian share in software exports.

3a. Domestic and Export Software Market

As stated by NASSCOM, the IT industry is diversified across three major focus segments: IT Services, BPO and software products and engineering services. India, with its large pool of skilled manpower has emerged as a major exporter of IT software and IT services have been the mainstay of the industry. A number of studies have looked into different aspects of India's IT software export boom, namely Schware, 1987, 1992; Sen, 1995; Heeks, 1996; Kumar, 2000, 2001; Arora et al, 2001; Joseph and Harilal, 2001; Parthasarathi and Joseph, 2002; Joseph, 2002. Exports continue to dominate the revenues earned by the Indian software and services industry where, the export intensity or the share of IT-ITES exports to total IT-ITES revenue has grown from 74.5 percent in 2001-02 to 78.9 percent in 2008-09. Total software and services exports are estimated to have grown from U.S. \$7.6 billion to U.S. \$46.3 billion in 2008-09, a Compound Annual Growth Rate (CAGR) of 28.6 percent. The annual turnover of the domestic and export software market of the Indian software industry can be summarised in Tables 6 and 7.

Table 6
Annual Turnover of the Domestic and Export Software Market of Indian Software Industry (1999-2005)

<i>Year</i>	<i>Total Turnover (In \$billion)</i>	<i>Domestic Exports Software Market (In \$billion)</i>	<i>Software Market (In \$billion)</i>	<i>Growth Rate in Exports over previous year (In Percent)</i>	<i>Export Intensity of Production</i>
1999-2000	5.3	1.9	3.4	31	64.1
2000-01	7.8	2.5	5.3	56	68.0
2001-02	8.7	2.5	6.2	17	71.3
2002-03	9.9	2.8	7.1	15	71.7
2003-04	12.8	3.6	9.2	30	71.8
2004-05	16.5	4.3	12.2	33	74.0

Note: 2004-05 represents estimated value; Figures may have some variations because of variation in the conversion rate of U.S. \$ from one fiscal year to another.

Source: Bhatnagar (2006) "India's Software Industry", Published in Technology, Adaptation and Exports: How Some Developing Countries Got It Right, Vandana Chandra (Ed.).

Table 7
Annual Growth Rate (1990-2000)

<i>Annual Compound Growth Rates</i>	<i>Growth Rate</i>	<i>Growth Rate over previous year (In Percent)</i>
1990-1991 to 1995-1996	78.18	54.74
1995-1996 to 1999-2000	61.63	51.82
1990-1991 to 1999-2000	60.02	46.10

Source: Bhatnagar Subhash (2006) - "India's Software Industry", Vandana Chandra (Ed.), in Technology, Adaptation and Exports: How Some Developing Countries Got It Right.

As observed from the break-up of Table 8, it can be noted that the Indian software industry has a unique distinction in that most of its output has been exported for the output value of India's software and service sector increased more than 18 times from less than U.S. \$830million in 1994-95 to U.S. \$15.5 billion in 2003-04. Software exports as stated by Kumar and Joseph (2005) have made up 21.3 percent of India's total export revenue in 2003-04, up from 4.9 percent in 1997. National Association of Software and Service Companies (NASSCOM) Strategic Review (2010) has stated that the growth of the domestic and export market have been estimated to be in U.S. \$ billion 23.0 and 50.1 in 2010; in U.S. \$ billion 21.9 and 47.5 in 2009; in U.S. \$ billion 22.0 and 40.9 in 2008 and in U.S. \$ billion 16.2 and 31.7 in 2007.

Table 8
Indian Software and Services Sector (1991-2009)

Accounting Year	Exports Software Services (In U.S. \$billion)	Total IT Exports (In U.S. \$billion)	Software Export Growth (In Percent)	Customised Application and Packaged Domestic Software (In U.S. \$billion)	Domestic Software Services (In U.S. \$billion)	Total IT Domestic (In U.S. \$billion)	Domestic Software Growth (In Percent)
1998-99	2.55	2.55	33	0.32	1.04	3.14	8
1999-00	3.71	3.71	45	0.37	1.35	3.93	25
2000-01	5.43	6.54	46	0.43	1.75	5.40	37
2001-02	6.30	7.93	16	0.40	1.78	5.19	-4
2002-03	7.25	9.86	15	0.41	2.05	5.56	7
2003-04	8.86	12.97	22	0.87	2.34	7.82	41
2004-05	12.40	18.05	40	1.01	3.53	10.13	30
2005-06	17.06	25.69	38	1.66	4.68	12.98	28
2006-07	23.43	33.22	37	2.13	6.08	16.36	26
2007-08	32.89	47.02	40	3.20	9.22	23.68	45
2008-09	36.03	50.41	10	3.30	9.35	22.98	-3

Source: Dataquest Annual Reviews.

Table 9
Segment-wise Export Revenue Trends (2001-2009)

Year/Item	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	CAGR (In Percent)
IT Service	5.8	5.5	7.3	10.0	13.3	17.8	23.1	26.5	23.2
ITES-BPO	1.5	2.5	3.1	4.6	6.3	8.4	10.9	12.7	39.2
Software Products, Engineering Services	0.3	1.5	2.5	3.1	4.0	4.9	6.4	7.1	48.5
Total IT-ITES	7.6	9.5	12.9	17.7	23.6	31.1	40.4	46.3	28.6

Source: Department of Information Technology, Ministry of Communications and Information Technology, Government of India (2010).

Reviewing the segment-wise export revenue trends of Table 9, the fastest growing segment is software products, growing at a Compound Annual Growth Rate (CAGR) of 48.5 percent. Though the IT-BPO sector is export driven, the domestic market is also significant. The revenue from the domestic software and services market as seen in Tables 10 and 11 is estimated to have grown from U.S. \$2.6 billion in 2001-02 to U.S. \$12.4 billion in 2008-09, a CAGR of about 22.2 percent. In the domestic verticals of the Indian IT-ITES industry, the IT services segment has continued to dominate the domestic portfolio of the industry, though its share has declined from 80.8 percent in 2001-02 to 66.9 percent in 2008-09.

Table 10
Segment-wise Domestic Revenue Trends (2001-2009)

<i>Year/Item</i>	<i>2001-02</i>	<i>2002-03</i>	<i>2003-04</i>	<i>2004-05</i>	<i>2005-06</i>	<i>2006-07</i>	<i>2007-08</i>	<i>2008-09</i>	<i>CAGR (In Percent)</i>
IT Service	2.1	2.4	3.1	3.5	4.5	5.5	7.9	8.3	19.5
ITES-BPO	0.1	0.2	0.3	0.6	0.9	1.1	1.6	1.9	44.5
Software Products, Engineering Services	0.4	0.4	0.4	0.7	1.3	1.6	2.2	2.2	23.7
Total IT-ITES	2.6	3.0	3.8	4.8	6.7	8.2	11.7	12.4	22.2

Source: Department of Information Technology, Ministry of Communications and Information Technology, Government of India (2010).

Table 11
Revenue of Information Technology Sector (2009-2011)

<i>IT Sector</i>	<i>2009-10 (In U.S. \$billion)</i>	<i>2010-11 (In U.S. \$ billion)</i>	<i>Growth Rate in 2010-11 (In Percent)</i>	<i>CAGR 2005-06 to 2010-11 (In Percent)</i>
Exports	49.7	58.9	18.5	22.2
Domestic, of which:	14.0	17.2	22.8	23.7
(i) IT Services	8.9	10.9	22.5	20.8
(ii) ITES-BPO	2.2	2.8	27.3	29.3
(iii) Software Products	2.9	3.5	20.7	30.7
Total IT-BPO Services Revenue	63.7	76.1	19.5	22.5

Note: 2010-11 represents estimated value.

Source: Government of India (2010) - Economic Survey, Ministry of Finance and Company Affairs, New Delhi, pp.252.

3b. Composition of Customised Application Software Market

The major three components of IT services sector are custom application development, application management and support and training. Other significant components are IT consulting, systems integration, Infrastructure Services (IS) outsourcing, network consulting and integration as well as software testing. The

Indian customised application market may be segmented into comprehensive projects that have involved the entire software development cycle, has included specification, design and coding; projects that have involved largely coding only and projects that have involved maintenance of software.

As the components in the domestic and the export market have been analysed in Table 12, with reference to customised application software development, it can be stated in the opinion of Radhakrishnan (2003) that turnkey projects/services have been significant in both the segments, but are relatively higher in the domestic category. The component of domestic turnkey projects/services had only a share of 15.76 percent in the year 1991-92 and its share till 1996-97 has been 27.13 percent but has declined in its relative share and ended up as 12.71 percent in 2000-01. In case of turnkey projects or services, the export share in its production has ranged between 45 percent and 76 percent, which has also been significant, albeit lower than that of the custom software.

Table 12
Composition of Indian Software Development and Services
(Domestic and Export)

<i>Software Activity</i>	<i>Domestic Software (In Percent)</i>	<i>Export Software (In Percent)</i>
Turnkey Projects	28.6	31.5
Professional Services	4.1	48.4
Products and Services	52.0	8.8
Training	6.1	1.5
Support and Maintenance	3.2	3.0
IT Enabled Services	6.0	6.8

Source: Roy Sumit (2005) "Globalisation, ICT and Developing Nations: Challenges in the Information Age", Sage Publications India Pvt. Ltd. - New Delhi, pp. 151.

Reviewing the component, of domestic consultancy services, it can be noted that this component had a share of 50.98 percent during the year 1993-94, but then continually declined in its relative share to 21.26 percent in 1999-2000 and had picked up only in 2000-01 to 26.63 percent. The share of export in the consultancy services has exhibited a range of 78 percent to 90 percent on par with that of custom software development. It can be further stated that when the export share of each of these segments in the total services production as well as software production as a whole has been considered, it has emerged that the export orientation of custom software has been predominant, leading the software export growth and even software growth as a whole. With respect to software services, the major portion has comprised of custom software development and its share has declined only during 1993-94 but picked up owing to certain indigenous or international market conditions or political developments, like visa restrictions as observed from Table 13.

Table 13
Categorisation of Services in Indian Software Industry (1993-2001)

<i>Year</i>	<i>Custom Software Value (In Rs. crore)</i>	<i>Custom Software (In Percent Share)</i>	<i>Turnkey Projects/ Services Value (In Rs. crore)</i>	<i>Turnkey Projects/ Services (In Percent Share)</i>	<i>Consultancy Services Value (In Rs. crore)</i>	<i>Consultancy Services (In Percent Share)</i>
1993-94	334	26.62	281	22.40	639	50.98
1994-95	695	36.81	424	22.43	770	40.76
1995-96	1,014	37.39	585	21.57	1,113	41.04
1996-97	1,524	36.80	1,124	27.13	1,494	36.07
1997-98	3,107	41.55	1,750	23.40	2,621	35.05
1998-99	6,575	53.14	2,391	19.32	3,407	27.54
1999-00	11,446	63.18	2,818	15.56	3,852	21.26
2000-01	17,150	60.67	3,593	12.71	7,527	26.63
Growth Rate 1989-90 to 2000-01 (In Percent)	48.66	-	50.66	-	41.63	-

Source: Radhakrishnan K.G. (2003) "India's Software Industry: A Structural Break-Up" in Journal of Indian School of Political Economy, July -September, Vol. 15 No. 3, pp. 693.

As noted by Roy (2005), the bias of Indian software exports towards turnkey projects and professional services has contributed 31.5 percent and 48.4 percent as contrasted with domestic software towards turnkey projects and professional services that have contributed 28.6 percent and 4.1 percent respectively while, products and services have contributed 52 percent.

3c. Global IT Services Market and Share of Indian Software Exports

Major reliance on software service exports by Indian software exporters primarily on information and software services that has included custom software work, programming services, manpower training, consulting and developing of customised software products has caused India, a competitive disadvantage in the global market where competitors rely much less on the export of software services and more on the export of software packages. As revealed in Table 14, an estimated breakdown of export type for Indian software companies in relation to its competitors has been shown. India's export profile has been skewed compared to that of its close competitors who have been successful in diversifying their exports. Lack of diversification has made India vulnerable in the future, when increased competition is expected in the international software market. Attention

Table 14
Global IT Services Market and India's Share in Indian Software Exports(2001)

<i>Software Services</i>	<i>Global Market (In \$ billion)</i>	<i>Global Market (In Percent)</i>	<i>India's Exports (In \$billion)</i>	<i>India's Exports (In Percent)</i>	<i>Share in Indian Software Exports (In Percent)</i>	<i>Potential for Indian Software Exports</i>
(A) Professional Services	128.6	36.8	2.9	37.5	2.2	-
IT Consulting	20.2	5.8	0.1	0.7	0.2 Negligible	Low-Medium
System Integration	71.0	20.3	0.2	2.0	0.2 Low	Low-Medium
Custom Application, Development and Maintenance	18.2	5.2	2.7	34.8	14.6 Very High	High
Network Consulting & Integration	19.2	5.5	00	00	Low	Low
(B) Product services	111.1	31.8	1.5	19.9	1.4	-
IT Training and Education	22.7	6.5	00	00	Negligible	High
Hardware Support & Installation	44.8	12.8	1.2	15.9	Negligible	Low
Packaged Software Support & Installation	43.6	12.5	0.3	3.9	0.7 Negligible	Medium-High
(C) Outsourcing services	109.3	31.3	3.2	42.7	3.0	-
Network/ System Infrastructure Services Management	11.1	3.2	00	00	Negligible	Medium-High
IS Outsourcing	63.6	18.2	00	00	Negligible	High
Application Management	11.2	3.2	1.8	23.0	15.6	-
Network & Desktop Outsourcing	21.6	6.2	1.5	19.7	6.9	-
Total	349	100.0	7.6	100.0	2.2	-

Note: In Column 1, Application Services: 1.8.

Source: Desai Ashok (2003) "The Dynamics of the Indian Information Technology Industry", DRC Working Papers, Global Software from Emerging Markets, Centre for New and Emerging Markets, London Business School, Volume No. 20, Business Standard, March, New Delhi, pp. 31.

has been drawn by Balakrishnan (2006) as well as Radhakrishnan (2003) to the fact that Indian software exports though impressive in terms of annual percentage of growth has been faced with the Indian companies finding themselves at the bottom rung of the value ladder, closer to the 'Support Function' paradigm that has meant a severe underutilisation of the skills of well-trained Indian engineers and this has adverse implications for the sustainability of software growth in future wherein, software exports have been poorly diversified with respect to product category, type of contracts and level of skills. It can be noted that India's share in the world software market has been very low wherein, Indian software export has constituted less than 2 percent of world software and related services market.

The major problem in the opinion of Datt and Sundharam (2009) is with the export-led growth that has been the element of uncertainty due to a shift in international policies that are exogenous in nature. Moreover, there are very few Indian software product companies and the reason for this occurrence is the relative lack of domestic market when it comes to hi-tech software. It may be further stated that most Indian software companies focus on services and it is difficult if not impossible, to find people with experience working for other product companies. The operational performance of the Indian software market has been clearly dependent on two major factor inputs, that is, labour and capital and hence, a review of the same has been undertaken in the next section.

4. THE FACTOR INPUTS IN INDIAN SOFTWARE MARKET

The software sector has been labour-centric or knowledge-intensive and this labour force has been employed by the Indian software industry that has consisted of a large and growing number of firms, made up of different entities that have produced software; has retained a largely competitive and pyramidal structure with a few large indigenous firms that have dominated the sector namely, private limited companies and ranges to public sector companies that have a diversified portfolio as compared to smaller firms; domestic IT companies as well as multinational companies that have a presence in India. As felt by Joseph and Harilal (2001) about 95 percent of the revenue of the software industry has been accounted for by undertaking a diverse range of operations including exports. An interesting feature of the supply base of software firms is the membership of the Indian software industry body, National Association of Software and Service Companies (NASSCOM) headquartered in New Delhi, with regional offices in the cities of Bangalore, Chennai, Hyderabad, Kolkata, Mumbai and Pune.

Table 15
Membership Strength of NASSCOM Members (1988-2010)

<i>Year</i>	<i>Number of Companies as Members</i>
1988-89	38
1989-90	71
1990-91	94
1991-92	131
1992-93	172
1993-94	212
1994-95	262
1995-96	356
1996-97	402
1997-98	464
1998-99	520
1999-00	600
2000-01	686
2001-02	724
2002-03	800
2003-04	820
2004-05	892
2005-06	981
2006-07	1,138
2007-08	1,285
2008-09	1,246
2009-10	1,237

Source: NASSCOM Annual Report (2009-10:11; 2008-09:10; 2003-04:15).

Using NASSCOM membership as a measure, the number of Indian software firms observed in Table 15 has been steadily increasing from 38 members in 1988 to around 850 members in 2001 and with over 1200 members in 2009. It can be stated that the relatively large and growing number of companies that have participated in the development and export of software has indicated the bias towards production for exports due to a mixture of market factors and policy encouragement. Indian software firms are widely diversified in their choice of activities or strategies and adoption of quality standards, for instance, SEI-CMM Level 5 has determined the growth and market share of software firms. The phenomenal success and growth of the Indian software industry is quite extraordinary when one considers that India is a very poor country with poor infrastructural investment, generally and in IT and an illiteracy rate over 33 percent.

4a. Derived Demand

Labour is one of the factors of production that firms combine and organise in order to generate output. The demand for labour is a derived demand and is

equivalent to its marginal productivity. Productivity is a key ingredient for labour demand and hence, the productivity performance of the software industry is analysed in terms of the most pervasive theory of the labour market, that is, is the neoclassical theory of labour supply and labour demand interacting to determine an optimal combination of wages and employment (Smith 2003, pp.2, 71). Using the classical competitive market analysis, demand for a factor of production has been a derived demand in the sense that a firm's demand for a factor of production has been derived from its decision to supply a good in another market. Demand for an input has depended on both the firm's level of output and the cost of inputs, for example, the demand for computer programmers has been linked to the supply of computer software. When a computer firm produces a new software program, it uses programmer's time, that is, labour; the physical space on which its offices are located, that is land; office building and computer equipment that has represented capital. Demand for a factor input when one factor has been variable, that is, labour and capital has remained constant using the Ceteris Paribus assumption in the short-run; has implied that the firm must decide how much labour it wants to hire or employ. The inter-relationship between pay, productivity and employment is established on one hand while, on the other hand, there exists the relationship between labour productivity and the firms demand for labour. The importance of productivity with respect to labour demand is assessed in terms of labour cost and capital utilised.

4b. Assessment of Labour Productivity in terms of Labour Cost

The labour market scenario in the Indian software market can be analysed through labour cost with respect to the comparative salaries of software professionals. The rising cost of labour and the cyclical bust in the Kondratieff's cycle named after *Joseph Schumpeter* in the 1930s can be applied to the cyclical behavior in the Indian software industry over time.

Software employers face increasingly severe short term problems in securing the skills they need, both quality and quantity and the transition to new generations of products and services to enable them to compete in increasingly networked markets with an innovated product in software technology. The question that arises is that whether this performance gap holds prospects for a move up in the value chain. Available studies put forward by Balakrishnan (2006), Radhakrishnan (2005), Joseph and Harilal (2001) have revealed that the Indian salaries of comparable personnel have ranged between 20-42 percent of U.S. levels and between 38-53 percent of Irish levels for different personnel in 1995 itself. In 1999, the revenue per employee in the Indian IT industry has been estimated to be of the order of only \$16,000, as against \$1,50,000 for Israel and \$70,000 for Ireland. It can be further pointed out that for programmers, the cost differential was as much as 10 times in 1997 wherein, the annual approximate salary of programmers with three to six

Table 16
Labour Cost: Comparative Salaries of Software Professionals
(In U.S. \$ per annum as on 1995)

<i>Designation</i>	<i>Switzerland</i>	<i>U.S.</i>	<i>Canada</i>	<i>U.K.</i>	<i>Ireland</i>	<i>Greece</i>	<i>India</i>
Project Leader	74,000	54,000	39,000	39,000	43,000	24,000	23,000
Business Analyst	74,000	38,000	36,000	37,000	36,000	28,000	21,000
Systems Analyst	74,000	48,000- 57,500*	32,000	34,000	36,000	15,000	14,000
Systems Designer	67,000	55,000	36,000	34,000	31,000	15,000	11,000
Development Programmer	56,000	41,000	29,000	29,000	21,000	13,000	8,000
Support Programmer	56,000	37,000	26,000	25,000	21,000	15,000	8,000
Network Analyst/Designer	67,000	49,000	32,000	31,000	26,000	15,000	14,000
Quality Assurance Specialist	71,000	50,000	28,000	33,000	29,000	15,000	14,000
Database Data Analyst	67,000	50,000	32,000	22,000	29,000	24,000	17,000
Metrics/Process Specialist	74,000	48,000	29,000	31,000	N.A.	15,000	17,000
Documentation / Training Staff	59,000	36,000	26,000	21,000	N.A.	15,000	8,000
Test Engineer	59,000	47,000	25,000	24,000	N.A.	13,000	8,000

Note: Figures are averages for 1995 and are likely to rise 5-10 per cent per annum with rates being slightly higher in lower-income countries; *(in U.S. dollars 1997); Conversion at an exchange rate of INR 41.50 per USD; N.A. stands for Not Applicable.

Source: Balakrishnan Pulapre (2006) "Benign Neglect or Strategic Intent? Contested Lineage of Indian Software Industry" in *Economic and Political Weekly*, September 9, Vol. 41, pp. 3868.

years of experience would be \$5,000 in India, \$16,000-17,000 in Singapore and \$20,000 in Hong Kong. Computer professionals in India have earned only about one-sixth to one-eighth of an average salary of a British or U.S. professional. Even the South-East and East-Asian, that is, Hong Kong, Taiwan, South Korea and Singapore software engineers have earned four times as much as the Indian professionals. This labour cost comparative analysis can be observed in Table 16.

Indian firms as observed by Arora (2006) have been short of capital, infrastructure as well as management and a substantial business has consisted of providing and utilising temporary programmers wherein, Indian firms have often acted as sub-contractors to established U.S. software services firms. Most of the clients have been user firms and most of the jobs have involved systems that these firms needed to run their businesses. Software firms, especially firms developing software products have outsourced more sparingly and have been more likely to simply 'rent' Indian programmers for tasks such as testing. Given the tight labor market conditions in the U.S., especially for IT workers, the availability of software development services from India has been of substantial value to many large and medium-sized U.S. firms that have been able to free up their in-house IT staff for more valuable and creative projects such as design and develop new types of applications. The Indian software industry has been largely complementary to the U.S. industry by providing essential maintenance and development services. The

tight labor market conditions have been reflected in the increase in wages and in attrition rates that have been said to be nearly 20-25 percent for the industry with nearly 40 percent of the workforce having 4-6 years experience.

It can be noted that the issue of low labour costs in India has not been able to provide any cost advantages to Indian software on account of the small size of the home market, the large marketing costs in the international market and the industry has been stuck at the lowest rung of the software value chain, namely, labour-intensive software services. In other words, reliance on services has limited the revenue-earning potential. In the opinion of Arora (2006), India not only has the largest number of people working in the software industry but also has the lowest revenues per employee. In other words, it can be stated that there is significant untapped potential that exists in the domestic market.

4c. Labour Participation by Women

The software industry in India has been highly male dominated, with about 86 percent of the labour force being men, a very young labour force, with a median age of 29.3 years. Earlier studies on the industry by Heeks (1996) and Pearson (1992) have reported an even higher domination of the industry by men with the share of women ranging at 5-10 percent. In terms of remuneration, women have been paid at an equal pay-scale. NASSCOM report (2000) has revealed that although the share of women in software professionals was low at 19 percent in 2000, it has increased steadily from just 10 percent in 1993. The domination of the workforce by men, however, does not seem to be due to a gender bias and this has further been supported by the studies conducted by Mitter in 1990 and by Jayanthi and Madhavan in the mid-1980s which have reported that the industry has offered a more relaxed and less discriminatory atmosphere than most other occupations. Reasons cited have included a lack of international mobility because of family commitments, regulations against night work, preventing companies from hiring them for round-the-clock contracts and some international clients' reluctance to hire women consultants, especially in West Asia.

4d. Assessment of Labour Productivity in terms of Capital

With respect to the constraints on public capital markets in India, Chithelen and Souza (2005) have felt that the major hurdle for Indian based professionals has been raising capital. The country has an infrastructure of lenders that have included banks and other financial institutions, mostly controlled by the central and state governments and these institutions have been known to have a bias in favour of established business in their lending decisions. The high recurring annual cost of such loans would be a financial burden for a start-up enterprise. The stock markets in India too have mostly failed to serve as a source of capital to new entrepreneurs, even though the major Mumbai stock exchange has been around

for well over a hundred years. Historically, the exchange has in part served as a mechanism for the Indian subsidiaries of multinational corporations to share some of their profits with those amongst the Indian elite who have invested in their stocks. While, the majority of public companies have been Indian owned, most of them have been controlled by well entrenched business houses and the financing chain with the stock market as the pivot to raise capital for their start-up enterprises has been largely absent in India.

In the opinion of Bhatnagar (2006), many Indian firms have been started by entrepreneurs who have acquired some wealth and experience working in larger established firms and then have set up new companies. Many of the corporate leaders have completed their graduate study in the United States and/or worked in the Silicon Valley and so, have a keen understanding of the software development process. The high profitability and relatively low risk of the industry has, therefore, attracted a large number of professionals since entry costs have been relatively low. Obtaining finance has been a major concern for firms developing software products since many of the firms have relied on equity financing as the primary source of capital although they have other diversified sources of finance such as loans and lease finance or have relied upon financing from their parent firm or from business groups with which they have been affiliated. In contrast to services, a substantial investment has been required to develop the product and even more to market the product where, venture financing in India for startups focusing on packaged products has been limited. The problem as felt by Arora et al. (2001) has appeared as much on the demand side than on the supply of venture capital.

Table 17
Authorised Capitalwise Number of Firms

<i>Authorised Capital (in Million)</i>	<i>Number of Firms (In Percent)</i>
Less than 1	31 (6.47)
Less than 5	67(13.99)
Less than 10	39(8.14)
Less than 30	77(16.08)
Less than 50	29 (6.05)
Less than 100	69 (14.41)
Less than 200	53(11.06)
Less than 500	27 (5.64)
Less than 1000	11 (2.30)
More than 1000	6 (1.25)
No information	70 (14.61)
Total	479 (100)

Source: Nath and Hazra (2002) "Configuration of Indian Software Industry" in Economic and Political Weekly, February 23, Vol. 37 No.8, pp. 740.

Table 17 has shown the authorised capital of the Indian software firms wherein, more than 65 percent firms have less than Rs. 100 million authorised capital. Only 1.25 percent of total firms have capital base more than Rs. 1,000 million. The average authorised capital of firms has been around Rs. 88.8 million as stated by Nath and Hazra (2002).

Table 18
Venture Capital/Angel Investments in High-Tech firms in India (1996-2008)

<i>Year</i>	<i>Rs. Million</i>	<i>U.S. \$ million</i>
1996	700	20
1997	3,200	80
1998	6,100	150
1999	14,000	320
2000	32,000	750
2001	50,000	1200
2008	450,000	10,000

Note: Years 2000, 2001 and 2008 are projected figures.

Source: NASSCOM Analysis.

As observed in Table 18 as well as according to NASSCOM, the investments made by venture capital funds in high-technology firms in India in 1999-2000 had amounted to U.S. \$370 million, rising from just \$20 million in 1996-97. It can be stated that a considerable part of this investment has gone into e-commerce start-ups and dotcom companies and the software industry may have received a relatively small part of this amount. It can be noted that Bangalore has been a beneficiary of all these initiatives provided for the functioning of the Indian software and services industry. In fact, the first venture capital institution in India, Technology Development and Information Co. of India Ltd., (TDICI), a subsidiary of a state owned and run financial institution, Industrial Credit and Investment Corporation of India (ICICI) was established in Bangalore in 1988, followed by bigger venture capital firms like Draper International, Walden International. The Government of India has also nucleated a National Venture Capital Fund for Software and IT Industry (NFSIT). Set up in association with various financial institutions and the industry, it encourages entrepreneurship in the areas of software, services, e-commerce and other IT related segments in which India has built up competence.

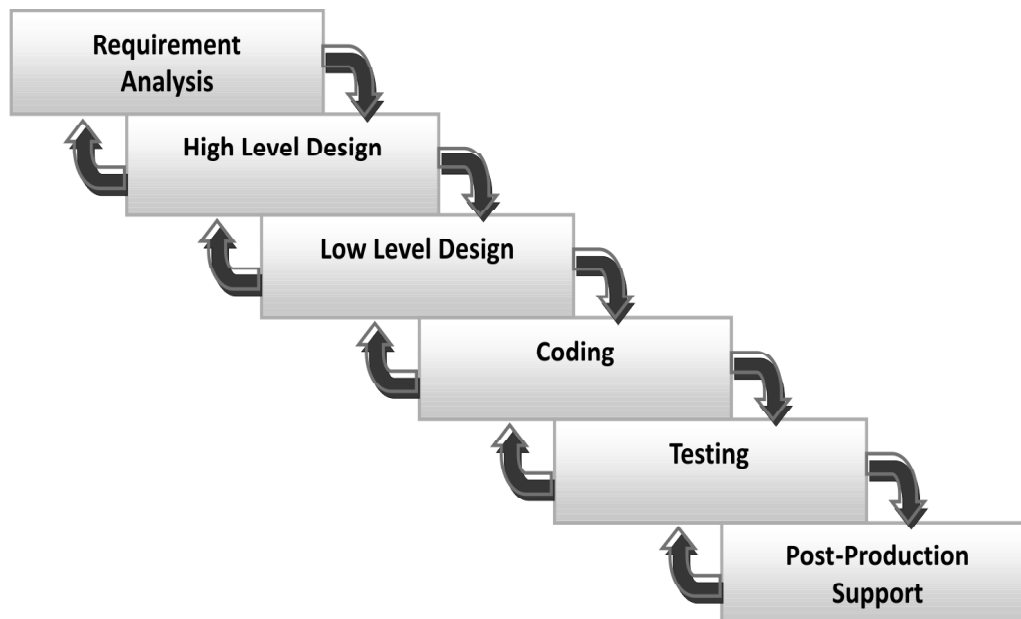
5. DEVELOPMENT OF INDIAN SOFTWARE INDUSTRY

The process of developing a final software product as observed in Figure 3 can be broken down into two consecutive stages wherein, the first stage has comprised of phases one to three of analysis and design that have represented the most advanced capability in software and can be defined as one where the idea of the

software has been conceived. Arora et al. (2001) have stated that the value added has been typically greater in this stage that has constituted the inaccessible high investment/ high risk and high skill activities part of the market. Such capability has been closely linked with the manufacturing industry, either in the form of in-house capability or with the highly skilled, experienced independent user software firms that has involved an understanding not only of the process requirements, its translation into source codes but has also required mature and sophisticated levels of skills and experience as well as considerable market information in order to develop the product idea that can articulate the requirement and design of the software for users.

The second stage has comprised of phases four and five of coding and testing that has involved an understanding of developing the source code, using a programming language and the translation from source code to machine code on compilers; has been more labour-intensive; has constituted the visible part of the market and has been the contractible jobs and the non-creative routine segments of the software production process that has involved the actual writing of the program and the testing of its effectiveness in applications as noted by Vijayabaskar et al. (2001) as well as by Nath and Hazra (2002).

Figure 3: Waterfall Model of IT Software Development



Source: Arora Ashish, Arunachalam V. S., Asundi Jai, Fernandes Ronald (2001) "The Indian Software Services Industry", in *Research Policy*, Volume 30, Number 8, October, pp. 1269.

Indian firms have usually provided low level design, coding and some types of testing services for export. Instead of product design and development, they have focused on taking on lower end functions such as maintenance and support. Although, not as lucrative, such activities involve a steady and predictable stream of revenues since maintenance contracts are typically three to five years in duration. In recent years, with improving infrastructure, such as greater bandwidth and larger number of servers, Indian firms have upgraded their ability to take on and manage larger projects; there is a change in the trend towards off-site software development since the year 2001-02 and the use of offshore development has helped Indian companies to provide competitive advantage to their clients.

Table 19
Major Destinations for Software and Services Export (2008-10)

[Value in Rs. crore (In U.S. \$ million)]

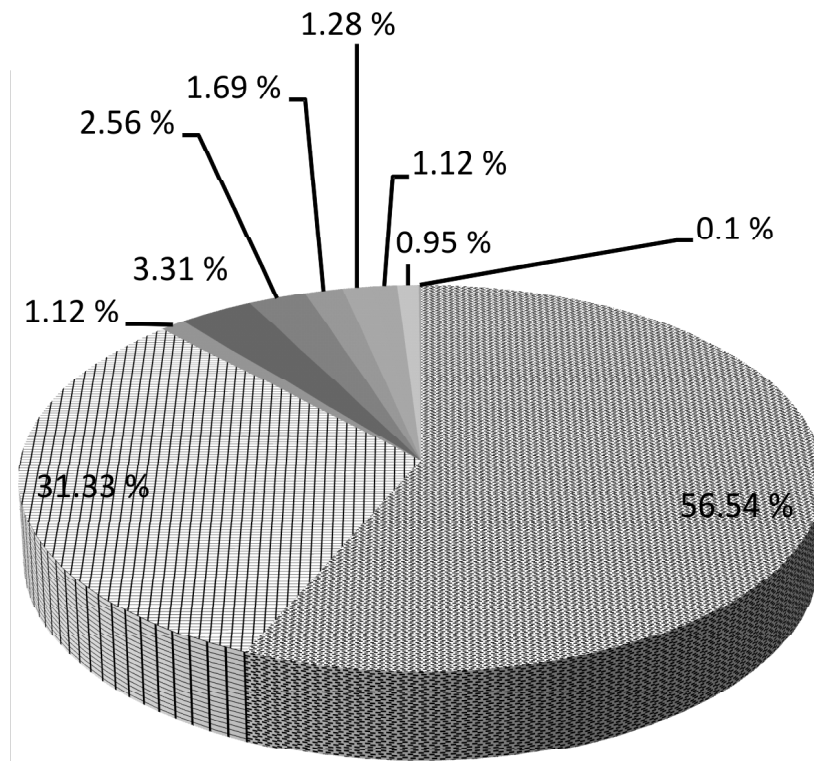
Destination	2008-09 Value	2008-09 Percentage of Sectoral Total	2009-10 Value	2009-10 Percentage of Sectoral Total	Variation (In Value Terms)	Variation (In Percentage Share Terms)
North America	133100.62 (28941.21)	58.42	136800.00 (28836.42)	56.54	2.78 -(0.36)	-3.22
Europe (EU) Countries	69489.37 (15109.67)	30.50	75800.00 (15978.08)	31.33	9.08 (5.75)	2.72
Europe (Non EU) Countries	2506.17 (544.94)	1.10	2700.00 (569.14)	1.12	7.73 (4.44)	1.45
Singapore, Hong Kong and Other South Asian Countries	6493.27 1411.89)	2.85	8000.00 (1686.34)	3.31	23.20 (19.44)	16.02
Middle East Countries	6835.02 (1486.20)	3.00	6200.00 (1306.91)	2.56	-9.29 -(12.06)	-14.58
Australia and Other Oceanic Countries	3873.18 (842.18)	1.70	4100.00 (864.25)	1.69	5.86 (2.62)	-0.32
Japan, Korea and Other Far East Countries	2734.01 (594.48)	1.20	3100.00 (653.46)	1.28	13.39 (9.92)	6.77
African Countries	2278.34 (495.40)	1.00	2700.00 (569.14)	1.12	18.51 (14.89)	11.59
Latin America	341.75 (74.31)	0.15	2300.00 (484.82)	0.95	573.01 (552.44)	533.74
Russia and C.I.S. Countries	182.27 (39.63)	0.08	250.00 (52.70)	0.10	37.16 (32.97)	29.16
Total	227834.00 (49540)	100.00	241950.00 (51001)	100.00	6.20 (2.95)	-

Source: Statistical Year Book 2009-10, pp.47.

It can be stated that India is the hub of cheap and skilled software professionals that are available in abundance. This helps the software companies to develop cost-effective business solutions for their clients. Indian software companies can place their products and services in the global market in the most competitive rate and is the reason why India has been a favorite destination for outsourcing. Many multinational IT giants also have their offshore development centers in India. World total software and services market during the year 2009-10 is estimated to be U.S. \$950 billion.

World software and services market is dominated by U.S. with the share of 39 percent followed by Europe with the share of 36 percent, Japan with the share of 12 percent, China with the share of 6 percent and the Rest of the World with 1 percent. India's share in the world market during the year 2009-10 is estimated to be 6.83 percent as compared to 6.59 percent estimated in the year 2008-09. The major destinations of Indian software exports are represented in Table 19 and Figure 4.

Figure 4: Major Destinations of Exports for Computer Software and Services during 2009-2010 in Percentage Share



Source: Statistical Year Book 2009-10, pp. 47

It can be noted that in India's total export of software and services, the U.S. accounts for a share of over 55 percent during the year 2009-10, having come down from 57.10 percent in 2008-09, thus, remaining the top destination followed by the United Kingdom (U.K.). The other major countries of export for India's software export are Hungary, Singapore, Germany, Australia, Canada, France and Finland. Together, the top ten countries account for 86.89 percent of India's total software and services export though, the share of the top ten countries has come down from 90 percent in 2008-09. The remaining 144 countries accounts for a share of 13.11 percent (Statistical Year Book 2009-10, p. 45-46).

Table 20
India and her Competitors Compared

Parameter	India	Canada	Ireland	Israel	Philippines	China	Russia
Export Industry Size (In U.S. \$million)	9,500	3,780	1,920	900	640	1,040	165
Export focused Professionals	1,95,000	45,000	21,000	15,000	20,000	26,000	5,500
IT Employee Costs (In U.S. \$ per year)	5-12,000	36,000	25-35,000	25,000	7,000	9,600	7,000
Number of CMM-5 Certified Companies	60	NA	0	0	NA	2	3
Quality of IT Labor Force	High	High	High to Moderate	High	Moderate	Low Quality	High Quality
Infrastructure	Average	Good	Good	Good	Good	Average	Good

Note: N.A.: Data not available

Source: Bhatnagar Subhash (2006) - "India's Software Industry", Vandana Chandra (Ed.), in Technology, Adaptation and Exports: How Some Developing Countries Got It Right, World Bank, pp. 95-124.

It can be stated that the demand for Indian software exports to North America arises from different factors such as, shortage of skilled workers in U.S., cheaper labour, lower cost of production in India and the twelve hour time gap between U.S. and India which makes it possible to have twenty-four hour working days in the U.S. through networking. However, the share of U.S. has declined from 68.3 percent in 2005 to 60 percent in 2008, whereas, that of Europe has increased from 23.1 percent to 31 percent over the same period. Markets across Continental Europe and the Asia Pacific are also witnessing significant year-on-year growth. This trend towards a broader geographic market exposure is positive for the industry and a means of accelerating growth by tapping new markets. Table 20 has summarised India's position as compared to her competitors wherein, outsourcing has emerged

as an established trend of the industry internationally has been a spur to the growth of India's software exports. A comparative analysis between India and her competitors has revealed that the unique feature that India enjoys is her abundant English-speaking workforce while, her competitors, namely, China has a large IT workforce; Russia has high quality engineers; Philippines and Canada are fortunate to have English skills and cultural compatibility and Israel has large product development. The main limitation in the Indian context is the presence of ordinary infrastructure while, in the case of Canada and Ireland high costs are the dominant factor. The unstable economy in the case of the Russian and Israel economy is the main negative while, for Philippines and China, there is the lack of project managers. According to a World Bank survey, 82 percent of American companies have identified India as their top destination for software outsourcing. As pointed out by Cleetus, (1986), this form of export has actually been a disservice because it has never projected Indian skills, never established a continuing market and settled for whatever rates that could be obtained. It can be noted as put forward by Radhakrishnan (2003) that since export is mainly confined to the service segment, the Indian companies have been restricted to a limited segment of the global market and hence, in spite of the software boom in the country, India's share of the international market is miniscule.

6. FUTURE DIRECTION FOR INDIAN SOFTWARE MARKET

The Indian software industry has reflected over the years that there exists prospects of expanding market opportunities as well as exponential growth due to the competitive advantages that the country enjoys including a huge manpower base that is highly skilled and relatively cheap when compared to global standards, knowledge of the English language, proactive government policies and improvement in the telecom infrastructure. In case of the Indian software market, it is the services-based companies that dominate due to the high-risk profile of the product segment where the chances of product success is rather limited, the reason advanced is that this segment typically involves huge research and development investments and enormous marketing network. IT spend as a proportion of Gross Domestic Product (GDP) continues to be low when compared to the global markets, having increased to an estimated 6.1 percent in 2010-11 from 2.87 percent in 2003-04 while, software as a proportion of GDP is less than 3 percent since 2003. One area where India compares favourably to other developed markets is the declining level of piracy from around 89 percent in the year 1993; piracy levels in the domestic market have declined to around 63 percent in the year 1999 as compared to China with 94 percent, Vietnam with 97 percent and Indonesia with 89 percent.

6a. Demographic and Service-oriented Linkages

The directional move for the Indian software market can be seen through the linkage effect of relating the software market with the population as well as the software products and services that are feasible for the economy.

Table 21
Indian Population Profile (2001-2016)

<i>Category of Age Group</i>	<i>2001 Percent Share</i>	<i>2006 Percent Share</i>	<i>2016 Percent Share</i>
0-14	35.6	32.5	27.1
15-59	58.2	60.4	64.0
60+	6.2	7.1	8.9
Total Population in Numbers (In Millions)	1,027	1,114	1,268

Source: Illiyan Asheref (2008) "Performance, Challenges and Opportunities of Indian Software Export" in Journal of Theoretical and Applied Information Technology, Jamia Millia Islamia University, New Delhi-110025, pp. 1096.

India has been a software consuming market with a population more than 1.3 billion and more than 15,000 middle size and small size domestic firms. India exports nearly \$2 billion worth of software and Indian organisations collectively spend \$5 billion buying IT products and services; produces the maximum number of knowledge professionals as well as those who attend the short courses in IT offered by private training institutions that range from three weeks to one year or even more. The total IT software and services employment as stated by Illiyan (2008) has grown from 2,84,000 in 1999-2000 to 1.63 million in 2006-07, a growth of 22.7percent year to year. The indirect employment attributed by the sector is estimated to be about 8.0 million in the year 2007-08. The industry's direct employment has grown at a Compound Annual Growth Rate (CAGR) of 26 percent in the last decade, making it the largest employer in the organised private sector of the country. This translates to the creation of about 10 million job opportunities attributed to the growth of this sector. India has been well positioned to reap the demographic dividends as seen in Table 21 since India has the working population, that is, those in the age group of 15-59 years than the dependent population, below 14 years and 60 plus. Moreover, for the uninterrupted supply of trained and skilled manpower, India has about 357universities, comprising 15,600 colleges that turn out an average 2.5 million graduates every year.

6b. Backward and Forward Linkages

Backward and forward linkages are needed for the Indian software industry described by Ghemawat and Patibandla (1997) as an 'island of competitiveness'.

Software localisation is a highly technical process by which computer programs written in one language by members of one culture are translated into another language for use by members of another culture. It can be noted that the list of elements that need to be set apart so as to be 'localised' is not just text translations, but character sets, scrolling patterns, page geometries, dictionaries, search engines, colors, numbers, box sizes, names, dates as well as icons and has to do with the long-term planning cycle of software firms.

6c. Suggestions for Development

In order to tackle the issue of offsetting the rising wage costs and competition from other countries such as Philippines and China, Indian companies should make a conscious effort to increase exports of high value-added consulting with the development of domain expertise, providing higher-end programming solutions to their clients and export of packaged software as well as the focus on the export of end to-end services or by developing proprietary software tools that can lower the cost of providing the service taking an example of leading companies such as Tata Consultancy Services (TCS), Infosys, HCL Technologies, Wipro and Satyam Computer Services. Moving up the value chain of the software development process would involve providing conceptualisation, requirement analysis and design services as well. With respect to the building of alliances with other software nations, India should focus on its domestic market as a starting point and with an eye toward a more balanced strategy in the long term. In the era of globalisation, co-operation and collaboration are important for most Indian software companies have possessed domain expertise or project management skills.

The challenges as stated in NASSCOM (2010) have been on catalysing growth beyond the core markets, establishing India as a trusted global hub for professional services, harnessing information communication technology (ICT) for inclusive growth and balanced regional development, undertaking incremental training costs to ensure quality talent availability and to tackle expected costs rise due to wage inflation and increased attrition. The domestic economy needs an indigenous software industry as a key component for development and the indigenous software industry needs domestic business in order to flourish in line with the social and economic development agenda. An efficient financial market with a diverse mix of private and public equity to fuel growth so as to raise money for new ventures is another area that requires attention.

It may be suggested that from the viewpoint of the software products segment, there has been an increasing convergence of the information technology, entertainment and the telecommunication mediums of hardware devices utilizing software products. In this regard, telecommunication networks as well as with the rapid proliferation of mobile devices, this segment will witness an increase in demand for software applications and will be an important arena for concentration

of software products, a major revenue driver for the software industry. Similarly, the rising integration between hardware and software will result in the embedded software segment emerging as a major revenue driver. Growth in the software services segment in the domestic context is likely to be given an impetus by the large level of computerisation of banks, e-governance implementation, e-banking and greater customer focus.

The directional move of the Indian software market can be attained if the potential of the domestic software market is released to its realised capability, if and only if, the availability of infrastructural facilities are undertaken seriously by the Indian government wherein, facilities must be provided to constantly enlarge its network infrastructure construction and expand the service of telecommunications to penetrate the rural as well as urban areas. Provision of financial and other inducements to firms to take advantage of the Internet is another area to be worked upon. An enlargement of investment to general education and professional training will also ensure in keeping with the software industry requirements. The Indian educational system needs to train more students, by regularly updating the syllabi of computer engineering, electronics and IT in various technical institutions so that they have the expertise to be employed in software companies. In terms of the educational programmes, the Indian government in co-ordination with Indian universities and software firms should develop joint programs and initiatives. A participatory approach and linkages in the Indian software market should be the key solution to avoid the segmentation of the domestic and export markets.

In a nutshell, it can be stated that the Indian software industry has continued to be an export-led sector with the domestic market having witnessed maturity and growth. When both backward and forward linkages materialise the economy can end up producing complex final goods, a large variety of specialised inputs and have high wages as well as sustainable economic growth. Regional planning, identification of the export market involving the use and tapping of human resource in terms of both the urban and the rural sector is another directional move for the Indian software market.

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