

Software Industry in India : Product and Intellectual Property Focus

By

Vishal Kumar

Bachelor of Engineering in Electronics and Communications, College of Engineering, Anna University, Chennai, 1998

Submitted to the System Design and Management Program in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Engineering and Management

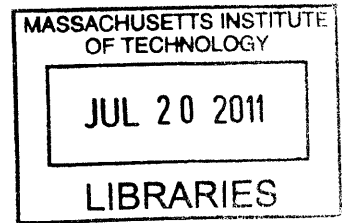
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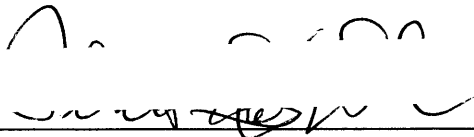
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Vishal Kumar
System Design and Management Program
February 28, 2011

Certified and Accepted By _____



Patrick Hale
Thesis Supervisor and Director,
System Design and Management Program

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ABSTRACT

India has established itself well as a powerhouse of talent in Information Technology (IT)/Software services, indicated by its exports of USD 54.33 Billion in 2010. Established in 1980s by the late Mr. Rajiv Gandhi, Prime Minister of India at that time, the focus on education and IT has paid rich dividends for the next generation. While a lot has been achieved by Indian entrepreneurs when it comes to software services, the same cannot be said about the Software Product segment which has remained out of focus so far. This is evident from the fact that Software Product based exports have remained less than 2% of the overall IT/Software industry exports so far. Many reasons are obvious and have been well studied in the past, while some are not very obvious and are less well explored. Using this thesis as an opportunity, an attempt has been made to explore these reasons, and some recommendations have been shared for architecting an ecosystem that can help foster Software Product and Intellectual Property (IP) focus.

Thesis Supervisor: Mr. Patrick Hale

Title: Director, System Design and Management Program

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I joined the System Design and Management (SDM) program because of its unique systems approach towards solving large-scale and complex challenges in system design, development and innovation. When I look back at my journey at MIT SDM program during the last year, the program not only gave me an ability to do just that but also encouraged me in applying the learned frameworks and tools in fostering positive changes within an organization, industry and society as a whole. The focus of my thesis is a direct result of such encouragement.

I would like to thank Pat Hale, my thesis advisor, who I have grown to understand and immensely respect during this time. With his invaluable insight, constructive feedback, flexibility despite a tight schedule, and timely words of encouragement, he has been a great influence in shaping this thesis.

I would like to thank the SDM faculty members, especially Brad Morrison (System Dynamics), James Utterback (Technology Strategy) and Tom Allen (Organizing for Innovative Product Development), whose invaluable teachings have had a significant impact on my thesis effort.

I would also like to thank Bill Foley, Chris Bates and others in the administrative office for their tireless efforts in ensuring that the SDM program complies with the highest standards, and granting me an opportunity to experience the SDM journey.

Last but not the least; I would like to acknowledge the sacrifices made by my wife Shikha and my son Sanshray. Their love, encouragement and support kept me focused and helped maintain a deep sense of belief in my effort.

TABLE OF CONTENTS

ABSTRACT.....	3
ACKNOWLEDGEMENTS.....	4
1. INTRODUCTION.....	9
1.1. INDIA A ‘SERVICE ECONOMY’	12
1.2. HISTORY OF IT/SOFTWARE INDUSTRY IN INDIA	14
1.3. MOTIVATION.....	18
1.4. HYPOTHESIS.....	19
2. METHODOLOGY.....	20
2.1. SCOPE	21
2.2. BEYOND SCOPE.....	21
3. INDUSTRY BEHAVIOR	22
3.1. EARLY PHASE LOOP	23
3.2. GROWTH SPURT LOOP.....	25
3.3. STRATEGIC FOCUS LOOP	28
3.4. PROCESS INDUCED GROWTH SUSTENANCE LOOP.....	31
3.5. CONSTRAINED GROWTH LOOP.....	34
3.6. COMMODITIZATION LOOP	40
3.7. LOWERED ATTRACTIVENESS LOOP	45
3.8. ROOT CAUSE FOR GROWTH CONSTRAINTS.....	46
3.9. MULTI-DIRECTIONAL EFFORTS	48
4. THE PRODUCT FOCUS.....	51
4.1. HISTORY OF PRODUCT DEVELOPMENT IN INDIA.....	52
4.2. HOW DO PRODUCT COMPANIES DIFFER FUNDAMENTALLY?	54
4.3. TRADITIONAL BARRIERS TO A PRODUCT FOCUS.....	61
4.4. WHY PRODUCT FOCUS MAKES SENSE ‘NOW’?.....	63
5. ENHANCING THE PRODUCT FOCUS.....	65
5.1. BUSINESS.....	66
5.1.1 VENTURE CAPITAL INVESTMENT.....	66
5.1.2 ANGEL INVESTMENT.....	68
5.1.3 TAX INCENTIVES	70

5.1.4	PROCUREMENT MANDATES	71
5.1.5	GOVERNMENT PROGRAMS	72
5.1.6	MARKET ACCESS	72
5.1.7	BRAND DEVELOPMENT.....	73
5.2.	CULTURAL	74
5.2.1	FAMILY EXPECTATIONS	74
5.2.2	ROLE MODELS.....	75
5.2.3	MANAGING WEALTH.....	75
5.2.4	IT MAJORS' R&D SPENDING	77
5.2.5	PRODUCT INDUSTRY JOB FAIRS FOR RETURNING INDIANS.....	79
5.3.	EDUCATIONAL.....	81
5.3.1	PRACTICAL CURRICULUM	81
5.3.2	CURRICULA WITH PRODUCT MANAGEMENT FOCUS.....	83
5.3.3	CURRICULA WITH ENTREPRENURIAL FOCUS	85
5.4.	INFRASTRUCTURAL	87
5.4.1	BUSINESS INCUBATOR SERVICES	87
5.4.2	MENTORSHIP SCHEMES	91
5.4.3	REFORMS IN IP LAWS	91
6	CONCLUSION.....	93
7	APPENDIX A: SURVEY QUESTIONNAIRE	97
8	APPENDIX B: ABBREVIATIONS	100
9	APPENDIX C: REFERENCES.....	103

Index of Figures

Figure 1: IT-BPO SECTOR REVENUES (in \$ BILLION) BY NASSCOM (ESTIMATES).....	9
Figure 2: IT-BPO DIRECT EMPLOYMENT BY NASSCOM (START OF YEAR ESTIMATES).....	10
Figure 3: IT-BPO SECTOR REVENUE GROWTH IN LAST DECADE.....	15
Figure 4: LOCATION ROADMAP FOR IT-BPO GROWTH.....	16
Figure 5: IT REVENUE BREAKUP ACROSS DIFFERENT VERTICALS ³	17
Figure 6: SYSTEM DYNAMICS MODEL FOR INDUSTRY	22
Figure 7: EARLY FOCUS LOOP (SIGNIFIED BY RED ARROWS)	23
Figure 8: GROWTH SPURT LOOP (SIGNIFIED BY RED ARROWS).....	25
Figure 9: MAP OF STPs IN INDIA.....	27
Figure 10: STRATEGIC FOCUS LOOP (SIGNIFIED BY RED ARROWS).....	28
Figure 11: PROCESS INDUCED GROWTH SUSTENANCE (SIGNIFIED BY RED ARROWS)	32
Figure 12: CONSTRAINED GROWTH LOOP (SIGNIFIED BY RED ARROWS).....	34
Figure 13: IT-BPO INDUSTRY EXPORT REVENUES.....	36
Figure 14: POTENTIAL MARKET AND INDIA'S SHARE ⁵	37
Figure 15: DIRECT EMPLOYEES FOR IT-BPO SECTOR.....	38
Figure 16: COMMODITIZATION LOOP (SIGNIFIED BY RED ARROWS).....	40
Figure 17: CHANGE IN ATTRITION LEVELS FOR TOP EMPLOYERS.....	42
Figure 18: ATTRITION AND WAGES FOR THE LAST 5 YEARS.....	44
Figure 19: LOWERED ATTRACTIVENESS LOOP (SIGNIFIED BY RED ARROWS).....	45
Figure 20: INDIA'S OPPORTUNITY AT RISK. SOURCE MCKINSEY ANALYSIS ⁵	49
Figure 21: PROF. CUCUMANO'S DEPICTION OF NATURE OF SOFTWARE FIRMS.....	54
Figure 22: FINANCIAL DIFFERENCES BETWEEN PRODUCT AND SERVICE FIRMS	58

Figure 23: REVENUE PER EMPLOYEE FOR LEADING PRODUCT AND SERVICE FIRMS60

Figure 24: ENHANCING THE PRODUCT FOCUS.....65

Figure 25: GLOBAL RANKINGS ON INNOVATION BY ECONOMIST INTELLIGENCE UNIT.....77

Figure 26: A SAMPLE LIST OF RECRUITING COMPANIES AT SHINE.COM³⁰80

Figure 27: ANNUAL PRODUCT MANAGEMENT AND MARKETING SURVEY BY PRAGMATIC
MARKETING84

1. INTRODUCTION

The foundations laid by the Indian government in the 1980s have paid off well. As predicted by the NASSCOM (National Association of Software and Services Companies, founded in 1988) Strategic Review for the Information Technology (IT)-Business Process Outsourcing (BPO) sector in India for 2011, the IT-BPO industry is estimated to aggregate revenues of USD 88.1 billion¹ in Fiscal Year (FY) 2011, with IT Software and Services accounting for about USD 76.1 billion¹.

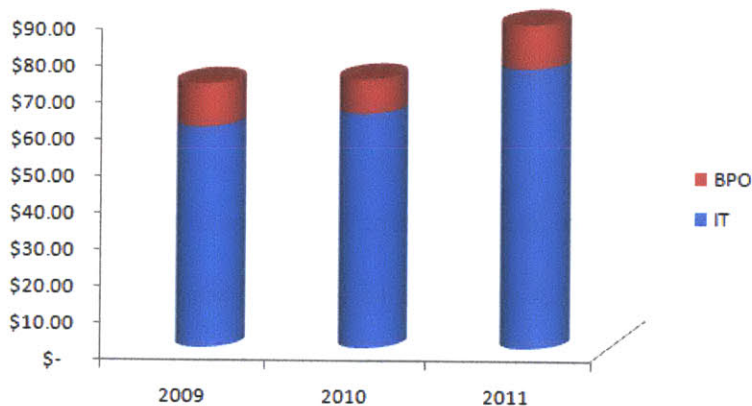


FIGURE 1: IT-BPO SECTOR REVENUES (IN \$ BILLION) BY NASSCOM (ESTIMATES)

During FY2011, direct employment in the sector is expected to reach nearly 2.5 million¹, with an addition of 240,000 employees¹ during the year, while indirect job creation is estimated to reach approximately 8.3 million¹. As per the report, the net value-added to the national Gross Domestic Product (GDP) by this sector has grown from 1.2 %¹ in FY1998 to an estimated 6.4 %¹ in

¹ NASSCOM, STRATEGIC REVIEW 2011 - IT-BPO SECTOR IN INDIA, 2011

FY2011. The sector's share of total Indian exports (merchandise plus services) has increased from less than 4 %¹ in 1998 to an estimated 26 %¹ in 2011.

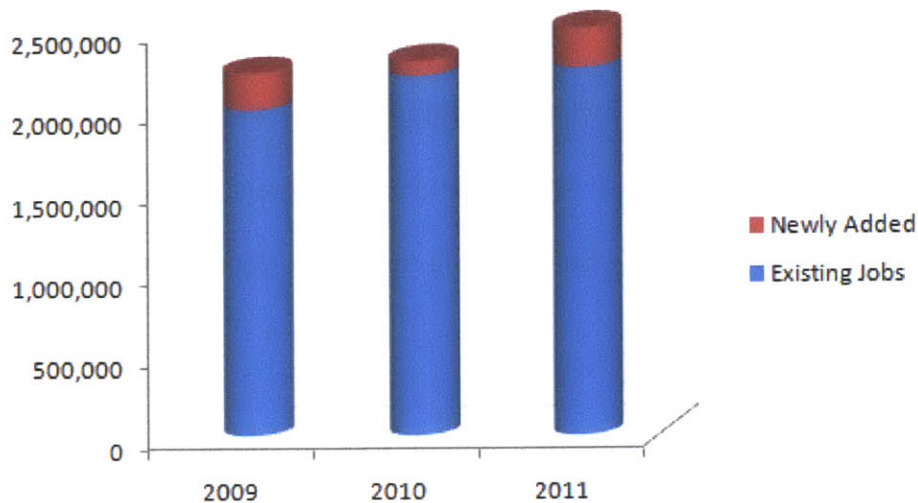


FIGURE 2: IT-BPO DIRECT EMPLOYMENT BY NASSCOM (START OF YEAR ESTIMATES)

While the growth has been phenomenal, there are significant challenges in maintaining such high growth rates in future. A major portion of revenues for IT and Software is 'service' focused, which offers limited opportunities for non-linear growth. Growth is heavily reliant and linearly proportional to the number of skilled professionals that the universities can produce, and when demand is expected to be high, there are questions about educational infrastructure's ability to keep up with the demand. Moreover, wages for skilled professionals are rising, as employers try to retain high performing employees under increasing employee attrition. This may erode India's traditional cost advantage as compared to source markets. Raising service prices indefinitely to make up for increasing labor costs may not be a sustainable option and may erode competitiveness.

To overcome such challenges, multi directional efforts are required. One such focus area is bringing 'Product' or 'IP' focus to the software industry. Through this thesis, an attempt has been made to understand various factors that influence creating and sustaining an effective product and innovation focused ecosystem.

1.1.INDIA A 'SERVICE ECONOMY'

India has traditionally been a service economy. As per International Monetary Fund (IMF) World Economic Outlook Database, April 2010, the Indian economy was the eleventh² largest in the world by nominal GDP and the fourth² largest by Purchasing Power Parity (PPP) in 2009. The country's per capita GDP (PPP) was \$3,176² in 2009. After being on the verge of economic collapse in early 1990s, government initiated strong economic reforms to encourage international competition and attract foreign investors. It is predicted that by 2020 India will be among the leading economies of the world, with a growth rate second only to China.

While agriculture had been the main focus area in pre-reform era, services have been primary contributors to the GDP post that era. Historically, most developing nations, including China in the past, have used manufacturing industry and labor arbitrage as the key ingredient for growth. India's situation is different, as its growth is mostly in knowledge-based and service industries. The fact that 50% of India's population is younger than 25 puts India in a position of strength for the future; however, on the flip side, a fundamentally service oriented economy also limits growth potential with its requirement to produce skilled knowledge workers year on year.

India's service industry accounts for 57.2%² of the country's GDP, while the industrial and agricultural sectors contribute 28%² and 14.6%² respectively. It ranks fifteenth² in services output. The services sector provides employment to 23%² of the work force and is growing quickly, with a growth rate of 7.5%² in 1991–2000, up from 4.5%² in 1951–80. IT and BPO are among the fastest growing sectors with a cumulative growth rate of revenue of 33.6%² between 1997–98 and 2002–03, contributing to 25%² of the country's total exports in 2007–08. The

² IMF, WORLD ECONOMIC OUTLOOK DATABASE, April 2010

growth in the IT/Software industry is primarily attributed to an availability of a large pool of low cost, but highly skilled and educated, workers with excellent English. This is matched on the demand side by an ever increased demand for outsourced IT/Software services from other countries.

1.2.HISTORY OF IT/SOFTWARE INDUSTRY IN INDIA

The seeds for the industry were sown as early as 1960s, when technical professionals from India sought jobs in western countries. This is primarily because at that time India's education system produced more engineers than could be employed. As a result of the various policies adopted by the Government of India, India was able to build a large science and engineering workforce. In 1951, the first Indian Institute of Technology (IIT) was inaugurated at Kharagpur in West Bengal. Demand from the United States (US) attracted a number of skilled Indian professionals aiming for research. By 1960, thousands of Indians were estimated to have migrated to the US.

The IT Services industry was born in Mumbai in 1967 with a partnership between Tata Group and Burroughs. The first software export zone, Santacruz Electronics Export Processing Zone (SEEPZ), was set up there in 1973. The National Informatics Centre (NIC) was established in March 1975. Following that, Computer Maintenance Company (CMC) was created in October 1976. In the following five years, various other IT companies like Tata Infotech, Patni Computer Systems and Wipro were founded. In 1980s, after witnessing the 'microchip' revolution in the West, the Indian Government was convinced that electronics and telecommunications infrastructure were vital for the future growth and development of India. Due to the policies adopted at that time, telecommunications infrastructure underwent significant improvements. During mid 1980s, the Indian government invested in three wide-area computer networking schemes:

- INDONET (to serve the IBM mainframes in India)
- NICNET (National Informatics Centre Network)
- ERNET (Education and Research Network)

As of 2009, the IT-BPO industry accounts for more than 5% of the country's GDP and export earnings, while providing employment to a significant number of its tertiary sector workforce. More than 2.3 million people are employed in the sector, making it one of the biggest job creators in India and a mainstay of the national economy. In 2010, annual revenues from IT/Software outsourcing operations in India amounted to more than \$ 50 billion.

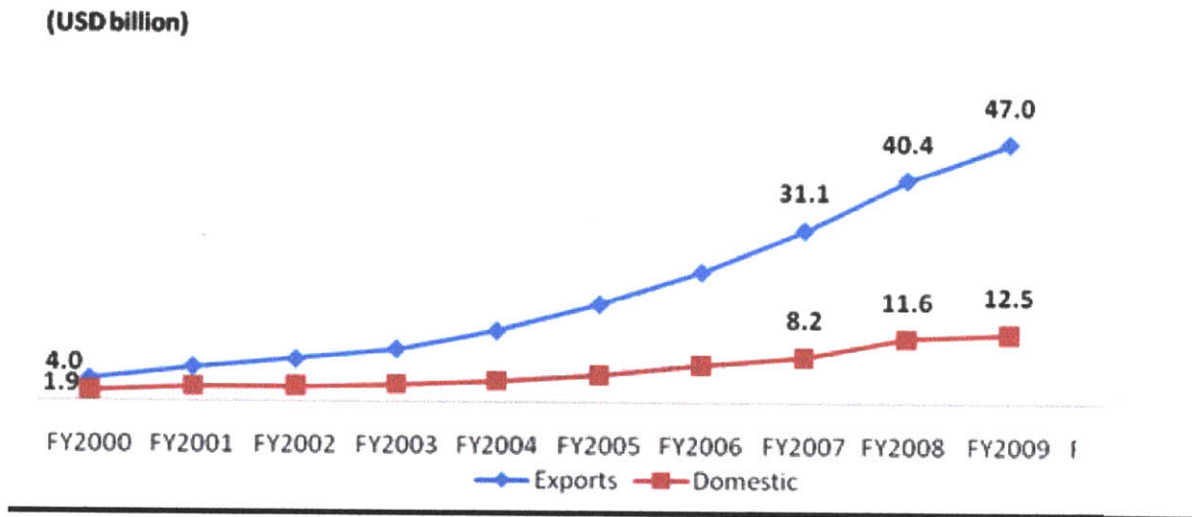


FIGURE 3: IT-BPO SECTOR REVENUE GROWTH IN LAST DECADE³

³ NASSCOM, STRATEGIC REVIEW 2009 - INDIAN IT-BPO SECTOR, 2009

Over the years, India developed a number of outsourcing companies specializing in customer support using the newly developed telecommunication channels and network links. Prominent cities for IT-BPO growth, as per a report⁴ by NASSCOM and A T Kearney have been shown in the following table:

Category	Indian Cities
Leaders	Bengaluru, Chennai, Hyderabad, Kolkata, Mumbai, NCR(Delhi, Noida, Gurgaon, Faridabad), Pune
Challengers	Ahmedabad, Bhubaneshwar, Chandigarh, Coimbatore, Indore, Jaipur, Kochi, Lucknow, Madurai, Mangalore, Nagpur, Thiruvananthapuram, Tiruchirapalli, Vadodara, Vishakhapatnam
Followers	Aurangabad, Bhopal, Goa, Gwalior, Hubli-Dharwad, Kanpur, Mysore, Nashik, Puducherry, Salem, Surat, Vijayawada
Aspirants	Allahabad, Dehradun, Durgapur, Gangtok, Guwahati, Ludhiana, Patna, Raipur, Ranchi, Simla, Siliguri, Srinagar, Varanasi

FIGURE 4: LOCATION ROADMAP FOR IT-BPO GROWTH

While the ‘leaders’ are well established industry hubs, it has been challenging for the state governments to scale the infrastructure needs to keep pace with rapid growth of the industry. As a result, the state governments have promoted the ‘challengers’. This has worked well both from industry scaling perspective and local employment perspective. While the adoption of ‘followers’ has been limited so far, the future holds promise. ‘Aspirants’ have not yet observed

⁴ NASSCOM and A T KEARNEY, LOCATION FOR IT-BPO GROWTH : ASSESSMENT OF 50 LEADING STUDIES, 2008

much activity, however an early focus on improving infrastructure like airports and connectivity will be a good strategic move.

As per Indian IT-BPO Industry factsheet³ by NASSCOM in 2009, the following pie chart depicts the break up for the IT revenues spread across different industry verticals:

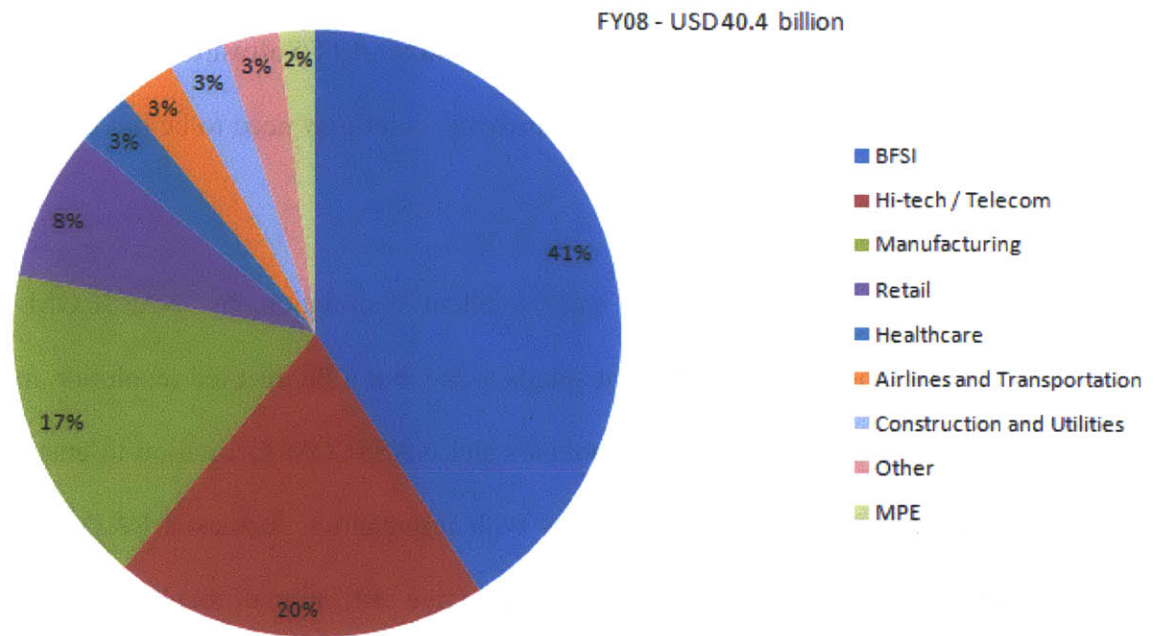


FIGURE 5: IT REVENUE BREAKUP ACROSS DIFFERENT VERTICALS³

With India's addressable market for the outsourcing industry expected to increase to USD 225 billion⁵ by 2020, the future holds promise. However, there are significant challenges related to India's ability to consistently capture that demand over the next decade.

⁵ NASSCOM AND MCKINSEY AND COMPANY, PERSPECTIVE 2020 : TRANSFORM BUSINESS, TRANSFORM INDIA, 2009

1.3.MOTIVATION

Observing India's IT/Software Industry landscape, it seems that it has all the right ingredients to produce truly world class, IP-driven software product companies. With a large and skilled talent pool being produced by its universities, an improving risk appetite on the part of investors, and more than two generations of experience working with leading customers from the demand economies, NASSCOM's prediction that 4th wave of IT/Software sector development would be led by an IP revolution seems likely. However, a lot may need to be put in place yet to facilitate this development.

Strategic government policies and excellent facilitation by NASSCOM has driven the IT/Software industry to the level it stands today, but a Product led revolution may demand much more than favorable government policies and NASSCOM facilitation to ensure that the growth trend continues. Focused partnerships with universities, increased R&D spending by leading service companies, cultural changes and effective utilization of incubation infrastructure must all work hand in hand to enable this.

In this thesis, an attempt is made to understand the sustainability issues related to the service centric model of Indian IT/Software industry. An effort has also been made to come up with possible solutions, many of which are already being implemented by organizations, industry associations and the government of India.

1.4.HYPOTHESIS

- 1) Service centric growth of Indian IT/Software Industry is not sustainable in the long run, and can lead to an overly early maturity and stagnation.
- 2) Various ingredients and leading industry indications are in place to suggest that Indian IT/Software industry is ready for an IP focused revolution.
- 3) An IP focused effort needs to effectively tap into an available support ecosystem, and the support system may not be able to evolve at a sufficient pace for software product related revenues to add to overall industry revenues in a significant way.

2. METHODOLOGY

The following phased approach was followed:

Phase 1 comprised of studying relevant literature and the various sources—books, blogs, published market trends, and exchanges on various internet groups. A baseline understanding of India’s software ecosystem was gathered and key dynamics of the system were noted and analyzed. The areas studied were history of the IT/Software sector in India, educational system, start-up incubation infrastructure, entrepreneurship ecosystem, venture financing, IP laws, System Dynamics, taxation laws and accounting rules. etc.

Phase 2 was comprised through creation and dissemination of surveys. The surveyed groups were:

- Entrepreneurs - Current and past; product focused and service focused
- Relevant people in Indian IT/Software industry

The surveys were delivered electronically and the subjects were chosen randomly to eliminate any biases.

Phase 3 was comprised through system behavioral modeling. Sources for supporting information were:

- Understanding gained about IT/Software ecosystem and history by reading relevant literature
- Results gathered from surveys
- Personal experience from working in IT and Software product services industry

Phase 4 was comprised thorough root cause analyses of observed behaviors and identification of possible solutions. Further, the efforts were focused on IP and software product led initiatives, and how focusing on these could help promote sustainable long term growth for the IT/Software industry.

2.1.SCOPE

The thesis effort is limited to analyzing such companies and industries from India that have their core business activities in the areas of:

- IT Services
- Software Products
- Software Product Engineering Services

The following groups have been surveyed:

- Current entrepreneurs
- Past entrepreneurs
- Human Resource Personnel in IT/Software industry

2.2.BEYOND SCOPE

Any companies that are not part of IT/Software Industry have not been studied or surveyed. Such companies include the ones that deliver IT enabled Services, Computer Hardware product or services, or Telecommunication and Networking product and services.

3. INDUSTRY BEHAVIOR

The following causal model for industry's behavior has been created based on publicly available information, survey results and other relevant literature.

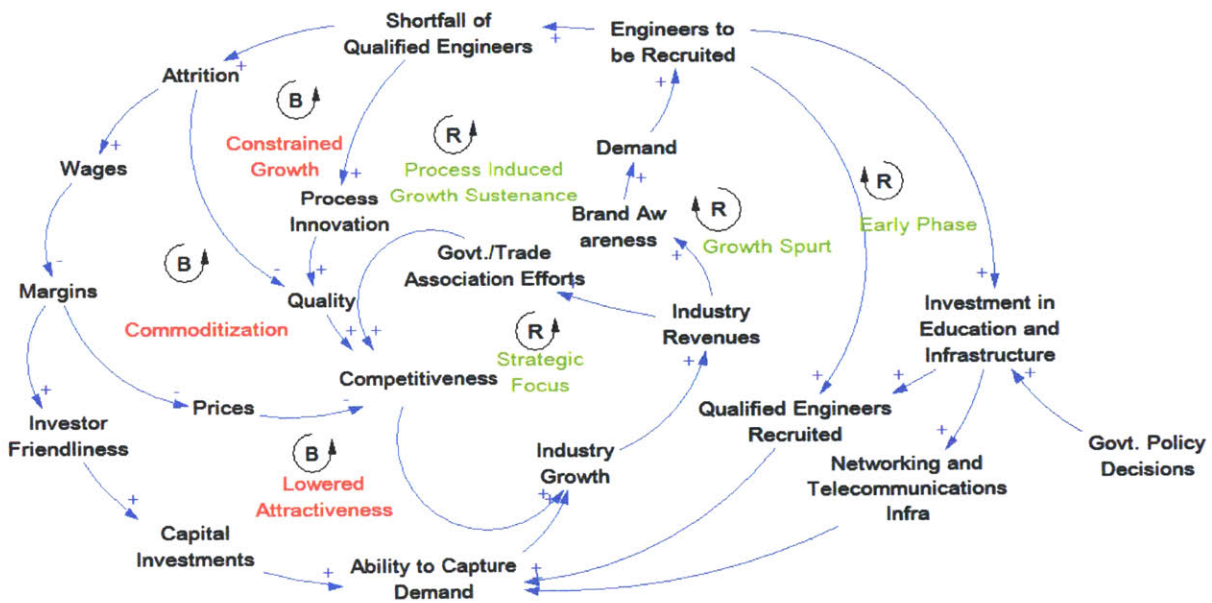


FIGURE 6: SYSTEM DYNAMICS MODEL FOR INDUSTRY

3.1.EARLY PHASE LOOP

This phase was observed from 1965 through late 1980s; however, seeds had been sown much earlier. The seeds for the industry were sown as early as 1960s, when technical professionals from India sought jobs in western countries. This is primarily because at that time India's education system produced more engineers than could be employed. As a result of the various policies adopted by the Government of India, India was able to build a large science and engineering workforce.

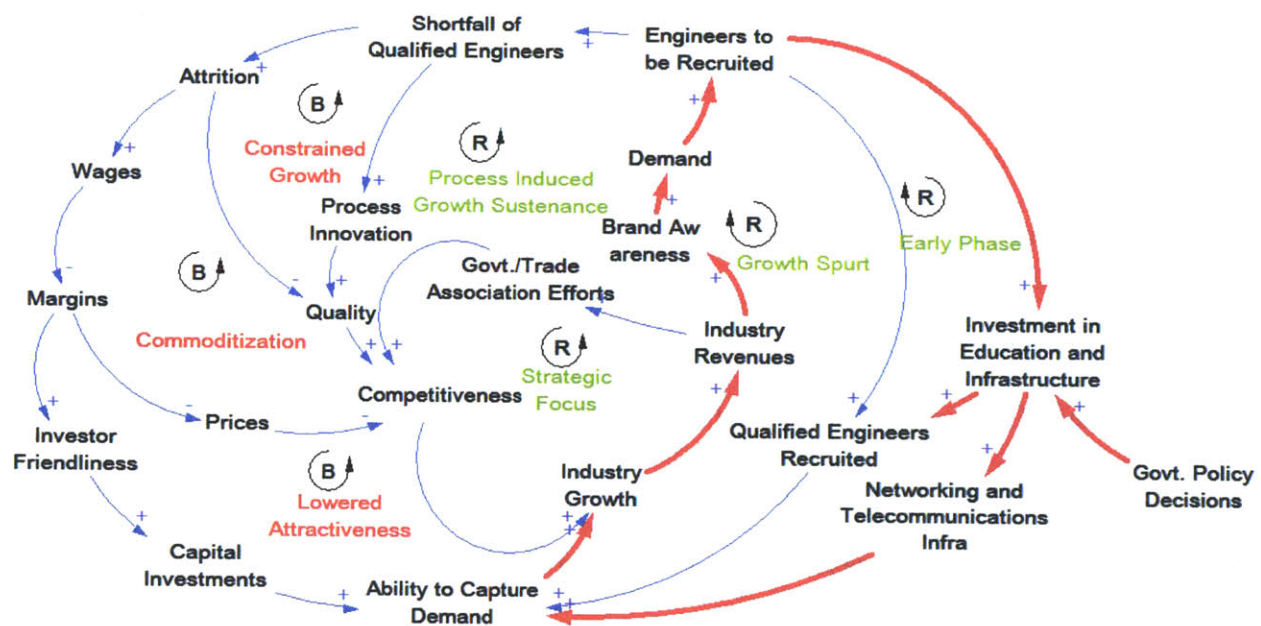


FIGURE 7: EARLY FOCUS LOOP (SIGNIFIED BY RED ARROWS)

In 1951, the first Indian Institute of Technology (IIT) was inaugurated at Kharagpur in West Bengal. Demand from the United States (US) attracted a number of skilled Indian professionals aiming for research. By 1960, thousands of Indians were estimated to have migrated to the US. Over the next few decades there was a conscious move towards establishing educational

institutions by the government. Over a period of time, reaching the following milestones were important achievements that defined future growth potential of the industry:

- Late 1960s – IT Services industry was born in Mumbai with a partnership between Tata Group and Burroughs.
- 1973 - The first software export zone SEEPZ, Mumbai was set up.
- 1980s – Greater than 80% of software exports were originated out of SEEPZ.
- 1975 – National Informatics Center(NIC) was established
- 1976 – Computer Maintenance Company (CMC) was setup.
- Late 1970s – Tata Infotech, Patni Computer Systems and Wipro were setup
- 1980s – Microchip revolution in the west led to significant investment in Telecommunications infrastructure by Indian government

With these investments in education and infrastructure, the industry's ability to capture demand was maintained. This led to increased industry growth and sizable revenues by late 1980s, which created brand awareness about India as a low cost IT/Software services destination. This contributed to the further increased demand described in the following section.

3.2.GROWTH SPURT LOOP

This phase began late in the 1980s when India's IT/Software industry, although still small, had reached a size which could not be ignored by global companies looking for outsourcing to low cost locations. The growth rates increased significantly with this new found brand awareness. NASSCOM was established in 1988, but it was still a few years away from creating a common voice for the industry. Nonetheless, the industry flourished due to ever increasing demand from western countries. This phase continued until year 2000; by that time Y2K solutions had created an unforeseen surge in demand for such services worldwide. It is notable that, until this time, the industry was still not significantly challenged by any shortage of skills or attrition. During this period, numerous Software Technology Parks were developed all over the country.

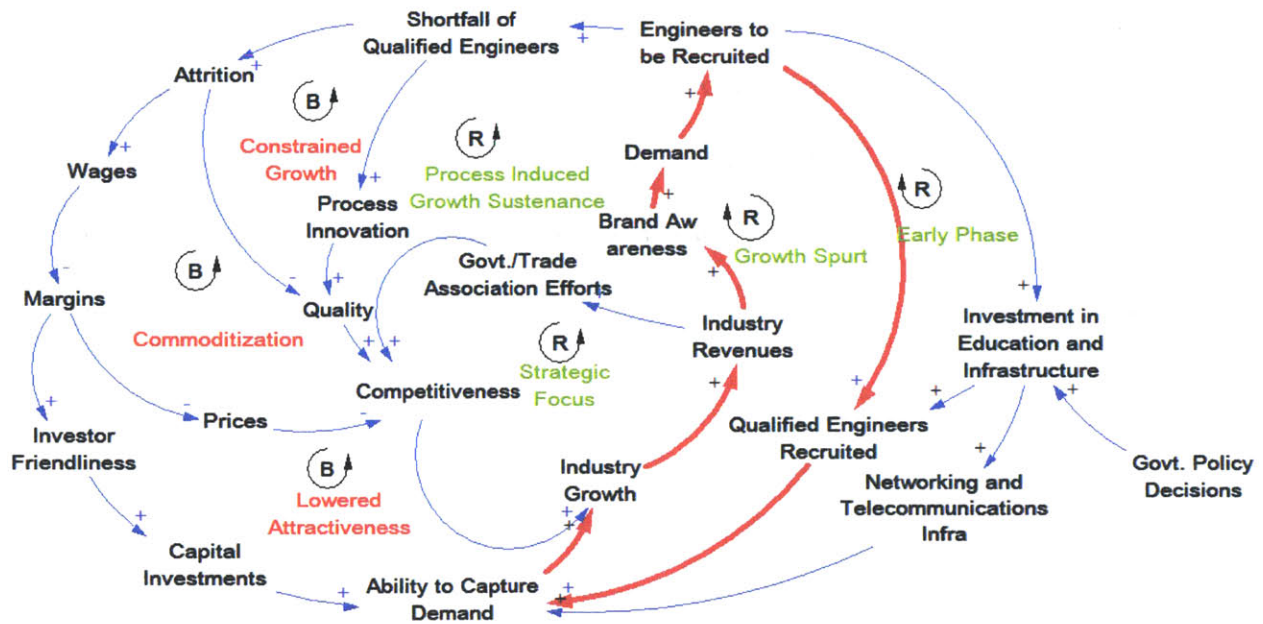


FIGURE 8: GROWTH SPURT LOOP (SIGNIFIED BY RED ARROWS)

Software Technology Parks (STP):

STPs are government instituted technology parks in India, and Software Technology Parks Institute (STPI) was established in 1991 by the Ministry of Communications and Information Technology. It is an export oriented scheme for the development and export of computer software and services. As noted on the website of the Ministry of Communications and Information Technology:

“THE STPI Scheme is lauded as one of the most effective schemes for the promotion of exports of IT and ITES. The 51 STPI centers that have been set up since inception of the program have given a major boost to IT and ITES exports. Apart from exemption from customs duty available for capital goods (with a few exemptions) there are also exemptions from service tax, excise duty, and rebate for payment of Central Sales Tax. But the most important incentive available is 100 percent exemption from Income Tax of export profits, which has been extended till 31st March 2011. STP Scheme is a pan India Scheme, which has centers spread across India; over 8000 units are registered under STP Scheme.”⁶

⁶ WEBSITE OF MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
([HTTP://WWW.MIT.GOV.IN/CONTENT/EXPORT-PROMOTION-SCHEMES-DPL-ELEC](http://www.mit.gov.in/content/export-promotion-schemes-dpl-elec))

Per the Ministry of Communications and Information Technology, the following map⁶ depicts the 51 STPs in India:

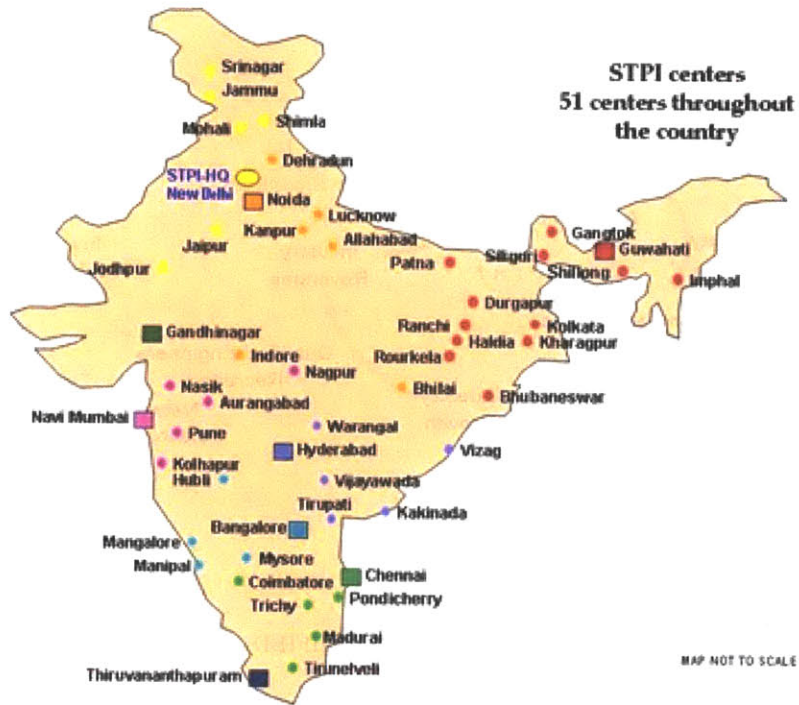


FIGURE 9: MAP OF STPs IN INDIA

3.3. STRATEGIC FOCUS LOOP

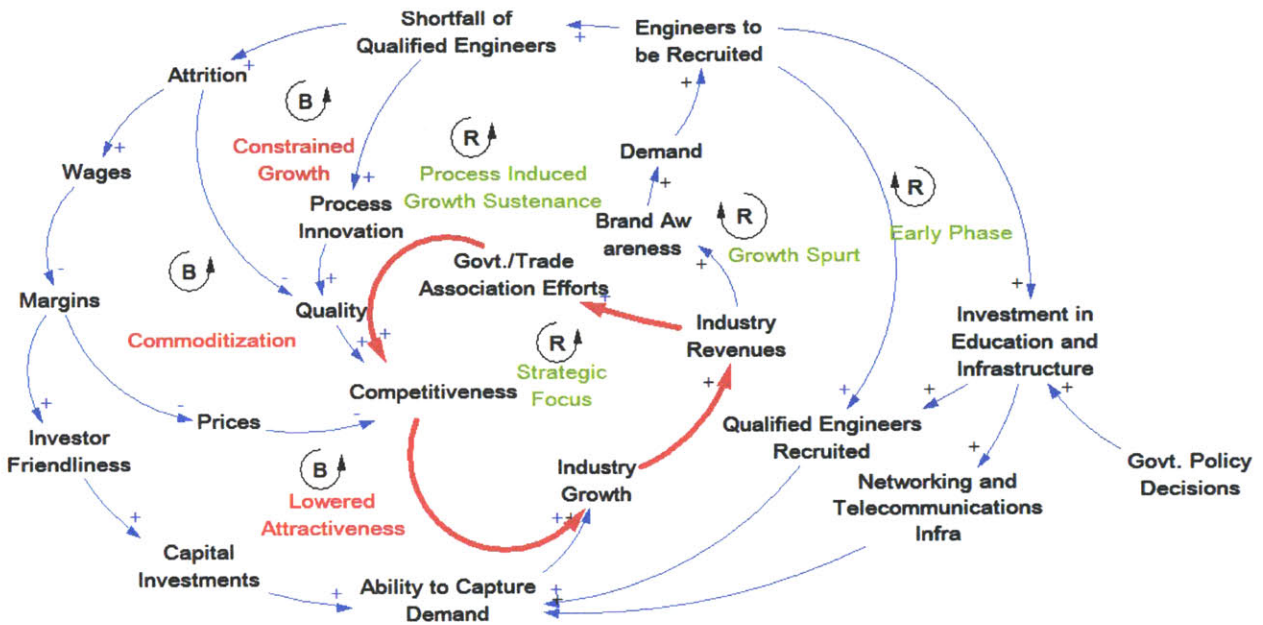


FIGURE 10: STRATEGIC FOCUS LOOP (SIGNIFIED BY RED ARROWS)

NASSCOM was set up in 1988 to facilitate business and trade in software and services and to encourage advancement of research in software technology. It is a not-for-profit organization, registered under the Indian Societies Act, 1860. With its emergence, there came a strategic focus to the industry's efforts. With competition from many other emerging countries, it was important to voice industry concerns and issues to not only to the government, but also to the procuring markets and NASSCOM members. Some of the well known initiatives of NASSCOM have been (as per NASSCOM website - <http://www.nasscom.in>):

- *Diversity and Inclusivity*
- *Domestic IT Market Initiative*

- **Education Initiative** – NASSCOM has partnered with differed government and semi-government agencies to takes part in the following educational initiatives:
 - *Establishment of 20 IIITs (Indian Institutes of Information Technology) – NASSCOM helps Ministry of Human Resource Development (MHRD) to operationalize the overall plan.*
 - *Building PhD capacity in India - partnering with Department of Science & Technology (DST)*
 - *Faculty Development Programs – In collaboration with Government of India*
 - *NASSCOM Assessment of Competence (NAC) – collaborating with IT-BPO industry.*
 - *Continuing Education Program – Collaboration with SII (Securities Investment Institute), UK*
 - *Employment oriented curricula – Collaborating with Indra Gandhi National Open University (IGNOU)*
 - *Finishing School – IT – Collaborating with engineering colleges to offer 2 month program to increase employability*
 - *Industry-Academia meets - NASSCOM organizes a large number of Industry-Academia meets to improve the understanding of industry trends and requirements and enhance employability in this sector.*

- **Global Enterprise Product Initiative**

- **Innovation Initiative**

The period 1995 and onwards can be noted as an era of strategic focus, with a keen eye on overall industry performance and professional attempts towards resolution of member and overall industry issues. This has helped the industry sustain its competitiveness under a testing environment fuelled by competition from other countries, currency fluctuations and staff attrition.

3.4.PROCESS INDUCED GROWTH SUSTENANCE LOOP

This phase was observed from 1995 through 2007. In the second half of 1990's many leading companies invested in process-focus with the following agenda:

- Create entries in large process-focused customer organizations
- Improve operational processes for cost reductions over the long run
- Reduce person-specific dependencies in an industry known for people as its primary resources
- Address challenges posed by ever rising rates of talent attrition
- In a rapidly changing world with increasing number uncertainties brought about by intentional and unintentional disasters, plan for business continuity and disaster recovery for their and customer's operations
- In an increasingly environment and climate conscious world, create an image for the company as one that favors and invests in adoption of a more sustainable environment

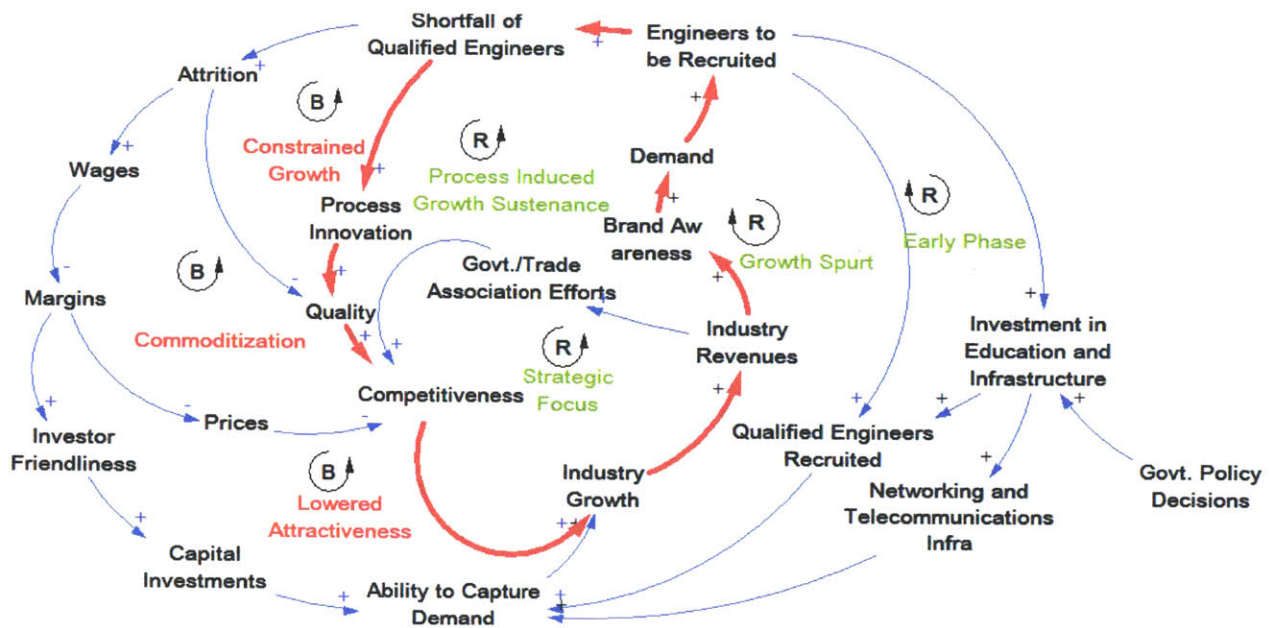


FIGURE 11: PROCESS INDUCED GROWTH SUSTENANCE (SIGNIFIED BY RED ARROWS)

Some of the notable investments were:

- Capability Maturity Model Certification** – The Capability Maturity Model (CMM) and now CMM Integrated (CMMI) certification is granted by Carnegie Mellon University’s (CMU) Software Engineering Institute (SEI). In India, Motorola’s India unit was the first to acquire an SEI CMM level-5 certification, in 1995. As of October 2001, India had 32 companies at SEI CMM Level 5 assessment-and at that time only 58 organizations across the world had acquired such an assessment.⁷A report by NASSCOM and McKinsey and Company has mentioned that as of 2008, 65%⁵ of all CMM level 5 certified companies are based in India.

⁷ RAJNEESH DE AND SRIKANTH R P, QUALITY BECOMES KEY TO INDIA’S IT GOALS (ACCESSED AT [HTTP://WWW.EXPRESSCOMPUTERONLINE.COM](http://www.expresscomputeronline.com)), DEC 2001

- **ISO 9001 Certification** - The ISO 9000 standards relate to quality management systems and are designed to help organizations ensure they meet the needs of customers and other stakeholders. The standards are published by International Organization for Standardization (ISO), ISO 9001 relates to the requirements that organizations wishing to meet the standard have to meet. Various third party certification organizations can provide an independent certification that ISO 9001 requirements have been met.
- **Total Quality Management (TQM)** - It is an integrative management philosophy for improving the quality of products and processes on a continuous basis.
- **Six Sigma certifications-** Six Sigma improves the quality of process outputs by identifying and removing the causes of defects and reducing variability in manufacturing and business processes.
- **ISO/IEC 27001 certifications-** This is an Information Security Management System (ISMS) standard, and a part of ISO/IEC 27000 family of standards, published by the ISO and the International Electro technical Commission (IEC).
- **The ISO 14000 certifications-** These are environmental management standards and help organizations minimize the impact on the environment due to their operations and comply with environmental regulations, and other environmentally oriented requirements.
- **People Capability Maturity Model (PCMM) certifications** - This framework focuses on continuously improving the people management practices and development of the human resources of an organization.

3.5.CONSTRAINED GROWTH LOOP

This phase is being observed since 2003, when, even though the industry growth has not slowed, there are leading indicators that a linear growth fuelled by the number of engineers being produced by universities is not sustainable in the long run.

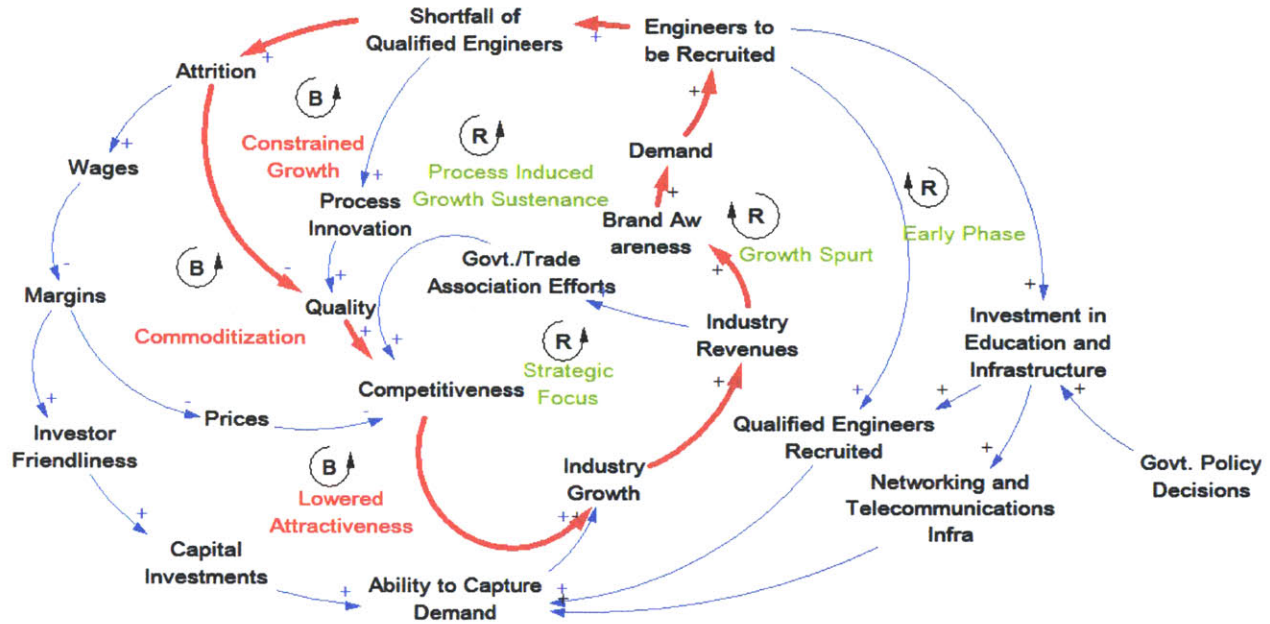


FIGURE 12: CONSTRAINED GROWTH LOOP (SIGNIFIED BY RED ARROWS)

Since the demand for services has been high, there have been patches of skills shortfall, primarily experienced during the timeframes 2003-2007 and 2009 and afterwards. During these times, the attrition has been on a rise due to the overall shortfall of engineers, which can lead (and may already have led) to deterioration in the quality of services. Quality of service is impacted when employees leave during the tenure of a project. While process improvements like the ones mentioned in the section 3.4 definitely reduce ‘person’ dependencies, the severity of deterioration can be dependent on the percentage of attrition. While many companies want to

maintain a healthy rate of attrition around 10-12 % which reduces poor performing employees, an attrition rate over 15% can be deteriorate the quality of service delivery. During the times of high demand, attrition rates of over 20% have been observed in patches. Given the fact that Indian universities produce 97,500 employable software engineers every year, the skill shortfall for the next few years can be gauged by the new employee hiring plans of the top three companies. As per media reports, these three companies plan to hire more than 150,000 new engineers in the year 2011. If we take the new hire projections for the overall industry, the skill shortfall may be much more.

With such a gap, the industry seems ill equipped to capture the high demand forecasted for the next few years. In this scenario, Indian companies reduce the barriers for companies from low quality – low priced nations to compete.

Industry Growth vs. Time

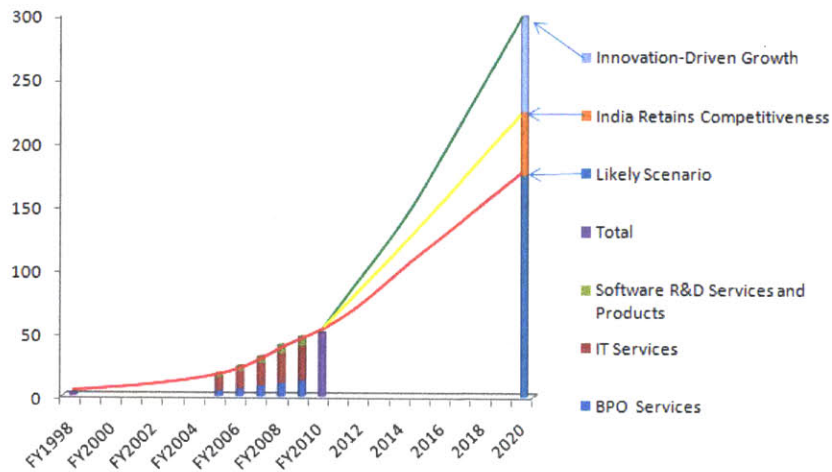


FIGURE 13: IT-BPO INDUSTRY EXPORT REVENUES

Historic data in figure 13 (2009 and before)³ is as per NASSCOM Strategic Review 2009 for IT-BPO Industry. Data for 2010⁸ is as per NASSCOM Strategic Review 2010 for IT-BPO Industry. Projected data for 2020⁵ is as per report prepared by McKinsey & Company for NASSCOM titled “NASSCOM Perspective 2020: Transform Business, Transform India”.

⁸ NASSCOM, STRATEGIC REVIEW 2010 – INDIAN IT-BPO SECTOR, 2010

Global Demand and India's Market Share versus Time

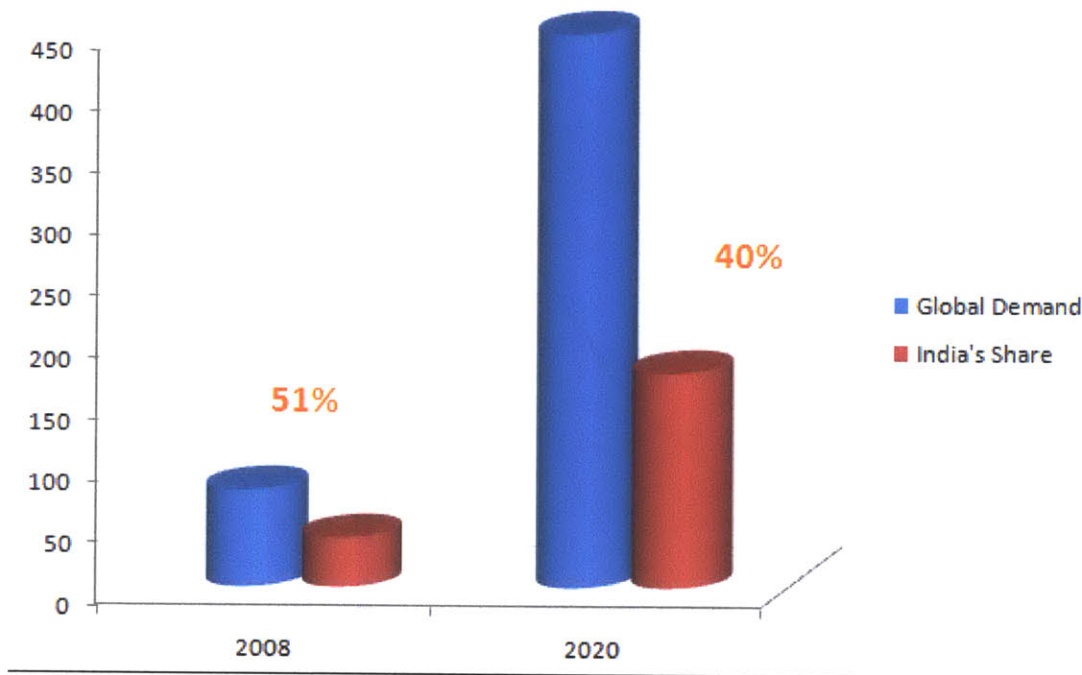


FIGURE 14: POTENTIAL MARKET AND INDIA'S SHARE⁵

Data in the graph above is as per report prepared by McKinsey & Company for NASSCOM titled "NASSCOM Perspective 2020: Transform Business, Transform India".⁵

It is clear that in the "Likely Scenario" (refer figure 13) of achieving revenues of USD 175 Billion in 2020, the IT-BPO sector loses 10% of its market share during the next decade.

Number of Skilled Workers versus Time

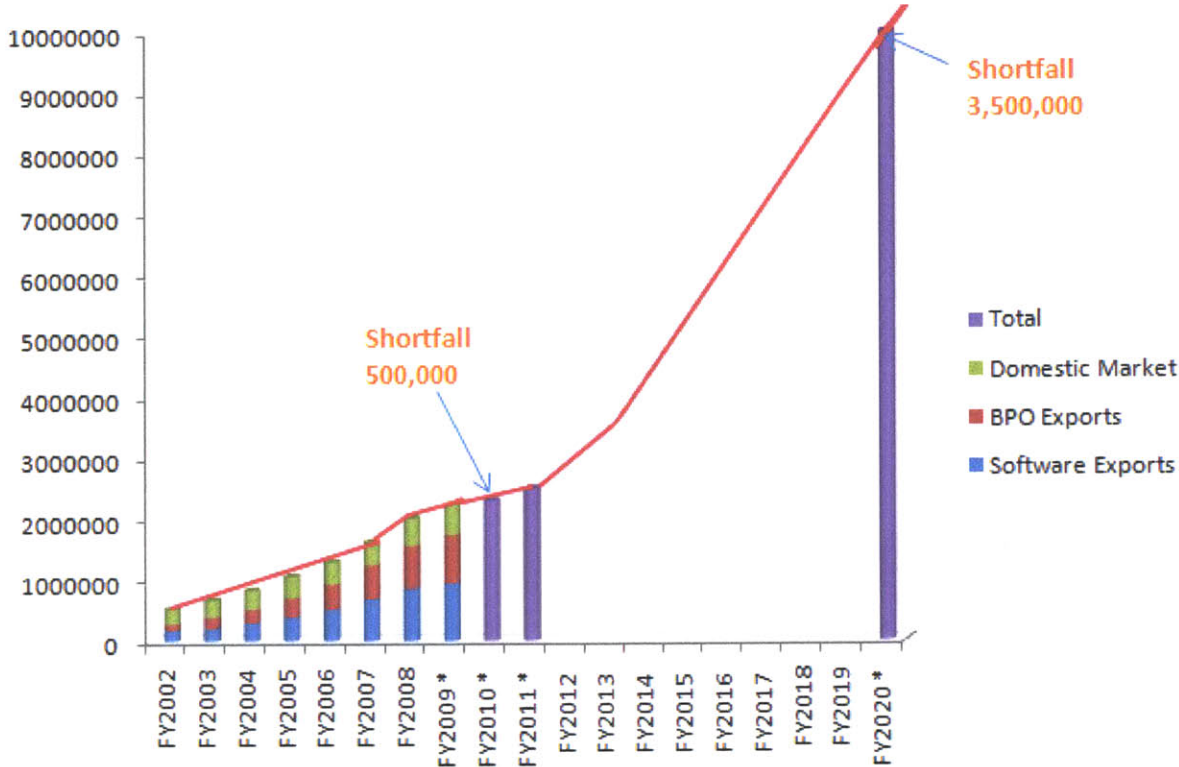


FIGURE 15: DIRECT EMPLOYEES FOR IT-BPO SECTOR

Historic data in figure 15 (2009 and before)³ is as per NASSCOM’s Strategic Review 2009 – Indian IT-BPO Sector. Data for 2010¹⁵ is as per NASSCOM Strategic Review 2010 – Indian IT-BPO Sector, and is an estimated number. Data for 2011¹ is as per NASSCOM Strategic Review 2011 – Indian IT-BPO Sector and is an estimated number. Projected data for 2020⁵ is as per report prepared by McKinsey & Company for NASSCOM titled “NASSCOM Perspective 2020: Transform Business, Transform India”.

It needs to be noted that the shortfall in skilled workers for the year 2020 (3,500,000), is applicable to the ‘Likely Scenario’ mentioned in figure 13, and has potential to restrict the IT-BPO sector revenues to USD 175 Billion, while the sector retains an ability to harness a higher

growth (as much as USD 225 Billion), if the educational infrastructure can ramp up to meet the shortfall.

The data in figure 15 is for overall IT-BPO sector, and as a result the shortfall numbers represent the overall sector. It needs to be noted that as per NASSCOM report, the breakup of these shortfall numbers could be 70% for BPO and 30% for IT/Software.

3.6.COMMODITIZATION LOOP

The shortage of new engineers can not only reduce quality, thereby reducing competitiveness, but also lead to higher wages. Companies that increase compensation to prevent employees from leaving or attract experienced engineers from other companies face the prospect of decreased operating margins. Such companies can choose to increase the price for services rendered to maintain their original levels of profitability. In such scenario, they reduce the barriers for companies from ‘similar quality – higher priced’ nations to compete.

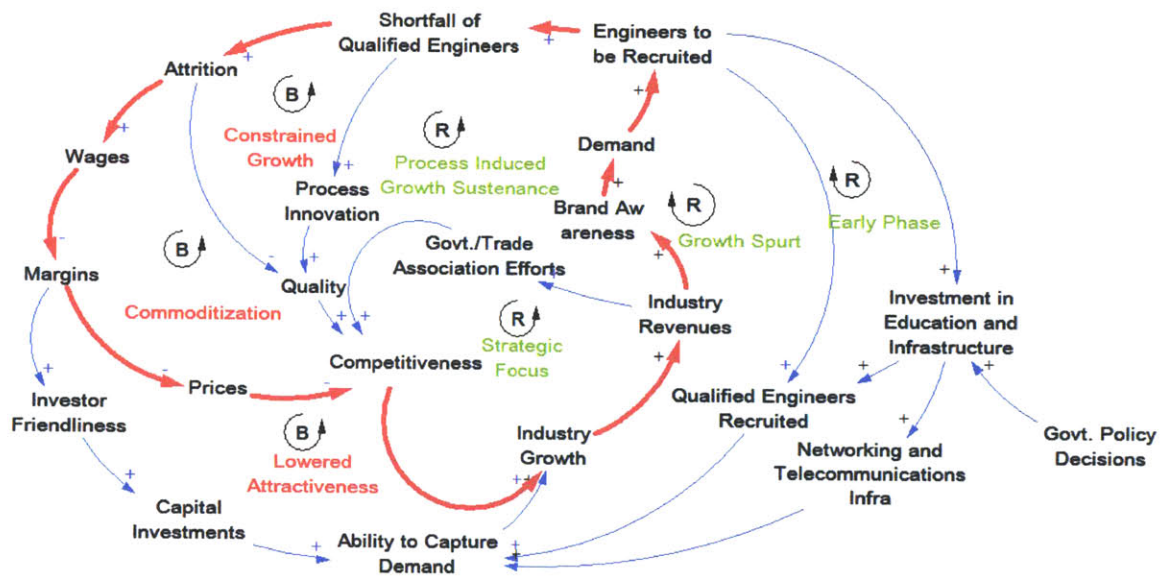


FIGURE 16: COMMODITIZATION LOOP (SIGNIFIED BY RED ARROWS)

Per Prof. Rishiksha T. Krishnan from Indian Institute of Management, Bangalore, in his book “From Jugaad to Systemic Innovation – The Challenge for India”.⁹

“Cost advantage tends to erode with time. In the software industry, India started with a cost advantage of 5:1 but this advantage has come down to 2 or 3:1 as wages to qualified professionals have risen about 20% a year.”

Wage rises at such levels are simply not sustainable, as it will not be long before the outsourcing companies will start moving towards emerging countries with lower priced models.

Attrition and Wages vs. Time

According to an article¹⁰ by Arup Roychoudhury and Supantha Mukherjee, published on Sep 30, 2010 and accessed at Reuters website (www.reuters.com):

“In June, industry body Nasscom had forecast that wages in the sector, which employs more than 2 million people, could rise 10-20 percent in FY11 and said attrition level as of March was up by 8-10 percentage points over the same period last year.”

In the same article¹⁰, Deependra Chumble, hiring manager at Hexaware Technologies Ltd. mentions that:

"We should stop the wage raises now only, otherwise our costs will become high, our margins will be slim and we will start losing business to China or Philippines. The speed of salary increases have started hurting us already"

⁹ RISHIKESHA T. KRISHNAN, FROM JUGAAD TO SYSTEMIC INNOVATION – THE CHALLENGE FOR INDIA, 2010

¹⁰ ARUP ROYCHOUDHARY AND SUPANTHA MUKHERJEE, INDIA IT ATTRITION SEEN EASING (ACCESSED AT WWW.REUTERS.COM), SEP 2010

As reported in an article¹¹ by Chandan Das, published on Oct 6, 2010 and accessed at website www.nearshoreamericas.com:

“Indian IT firms are now facing an unprecedented attrition crisis – even as the economic recovery takes shape. Attrition levels in the Indian IT sector had decline to approximately eight to 10 per cent during the economic recession in 2009, but the figures have skyrocketed to between 15 and 20 per cent in 2010”

The article¹¹ also lists the rise in level of attrition for the top four IT service providers, which is mentioned in the following table:

Company	Q1 2009	Q1 2010
Wipro	9.8%	23%
Infosys	11.1%	15.8%
HCL Technologies	13%	15.7%
Tata Consultancy Services	11%	13.1%

FIGURE 17: CHANGE IN ATTRITION LEVELS FOR TOP EMPLOYERS

11 CHANDAN DAS, ITS OFFICIAL: ATTRITION IS INDIA INC’S BIGGEST ENEMY (ACCESSED AT WWW.NEARSHOREAMERICAS.COM, OCT 2010

Further in the article¹¹, it is mentioned that:

“As a result of increased expenditure on account of inflated wages to retain the existing employees and training new recruits to fill up the vacancies caused due to attrition, the Indian tech firms have been witnessing a steady decline in their EBITDA. For instance, India’s second largest IT firm Infosys Technologies witnessed a decline of 2.36% in its operating margins during the June 2010 quarter in comparison to the March 2010 quarter.”

In an article¹² by Binu Paul, published on Oct 17, 2010 and accessed at Silicon India website (www.siliconindia.com):

“Although not a permanent solution to plug attrition, the leading IT players have already started to increase their pay packages to keep their existing employee base and to attract the talents. Infosys plans a 17 percent salary hikes for over 100,000 of its employees this year. Wipro also is reportedly contemplating on a second-round of hike in wages in the next few months.”

These articles and the related content indicate that an unusual rate of attrition in the last year is leading the companies to try various short term employee retention schemes, eventually eroding margins.

¹² BINU PAUL, POST RECESSION, ATTRITION TROUBLES IT INDUSTRY THE MOST (ACCESSED AT WWW.SILICONINDIA.COM), SEP 2010

The following relation between attrition and wages over time has been established:

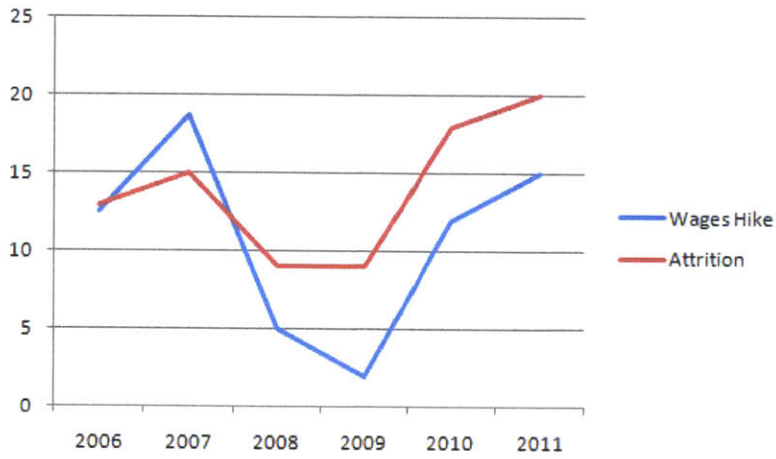


FIGURE 18: ATTRITION AND WAGES FOR THE LAST 5 YEARS

3.8.ROOT CAUSE FOR GROWTH CONSTRAINTS

The Federation of Indian Chambers of Commerce and Industry (FICCI) is an association of business organizations in India, headquartered at the national capital New Delhi. FICCI is one of the main organizations to fund and support many governmental and non-governmental educational institutes. In a survey done by FICCI in 2007 on emerging skill shortages in the Indian Industry, it is apparent that shortage of skilled, semi-skilled and unskilled workers has emerged as a critical factor impacting the competitiveness of Indian industry.

As per FICCI, skill shortages generally arise in the situations (a) when employers face difficulties finding staff with the appropriate skills, experience or qualifications to fill vacancies, (b) when employers find that there are skill gaps as the existing employees lack the required skills, qualifications and experiences and (c) when employers are unable to recruit the required staff due to other factors like low remuneration, unsatisfactory working hours, distant location, dearth of sector-specific specialized skills. The findings of the survey conducted by FICCI show that similar situations of skill shortages exist across many segments of the industry and economy of the country.

While FICCI administered the survey for 20 different industry sectors, it mentioned that specifically for IT industry in India, there was a requirement of 350,000 engineers per annum as of year 2007 against 150,000 highly skilled engineers available each year. It was estimated that there was expected to be a shortfall of 500,000 technology professionals by 2010.¹³ As of 2010, the projection given by FICCI in 2007 seems accurate and the situation may worsen in the coming years.

¹³ FICCI, SURVEY ON EMERGING SKILL SHORTAGES IN INDIAN INDUSTRY, 2007

The shortage of skills is the prominent root cause for some of the following balancing system dynamics loops which were described in the prior sections:

- Constrained Growth
- Commoditization
- Lowered Attractiveness

The service industry, by its very nature, is people enabled. The more people are involved, the higher the ability to meet demand, leading to higher revenues. However, although India is churning out more than 350,000 engineers (arguably) every year, only about 25% of this talent is employable in the IT/Software industry, which is approximately 112,500 engineers. With next year's projected hiring demands of top 3 service companies being more than this number (112,500), the industry appears to be severely understaffed for the future.

Figure 13 (IT-BPO Industry Growth Projections), shows that the industry's potential of attaining revenues of up to USD 300 Billion may not be realizable under the constraints posed by skill shortages and a lack of innovation focus.

Based on some of these arguments, our hypothesis that "Service centric growth of Indian IT/Software Industry is not sustainable in the long run, and can lead to an early maturity" seems valid.

3.9.MULTI-DIRECTIONAL EFFORTS

Understanding that the root cause for constrained future growth could be education infrastructure to keep pace with the demand of IT/Software services, the following policy level focus may be required:

1) **Increase in capacity of educational institutions to output skilled workers**

Significant efforts are underway with NASSCOM partnering with different government and semi-government agencies to take part in multiple educational initiatives. Some of these are:

- Establishment of 20 IIITs (Indian Institutes of Information Technology)
- Building PhD capacity in India
- Faculty Development Programs
- NASSCOM Assessment of Competence (NAC)
- Continuing Education Program
- Employment oriented curricula
- Finishing School – IT
- Industry-Academia meets

More about these initiatives has been mentioned in section 3.3. These programs and initiatives will definitely help bridge some of the gap of more than 350,000 skilled employees in IT-BPO sector by 2020.

2) Increase IP based software development focus

Moving focus to IP based software development has potential to effectively shield the industry from shortages of skilled workers, and can help increase non-linearity in the nature of revenues.

According to studies by NASSCOM and McKinsey and Company⁵, there is an opportunity at risk of \$ 80 billion, if India does not innovate on business models and focus on IP focused initiatives.

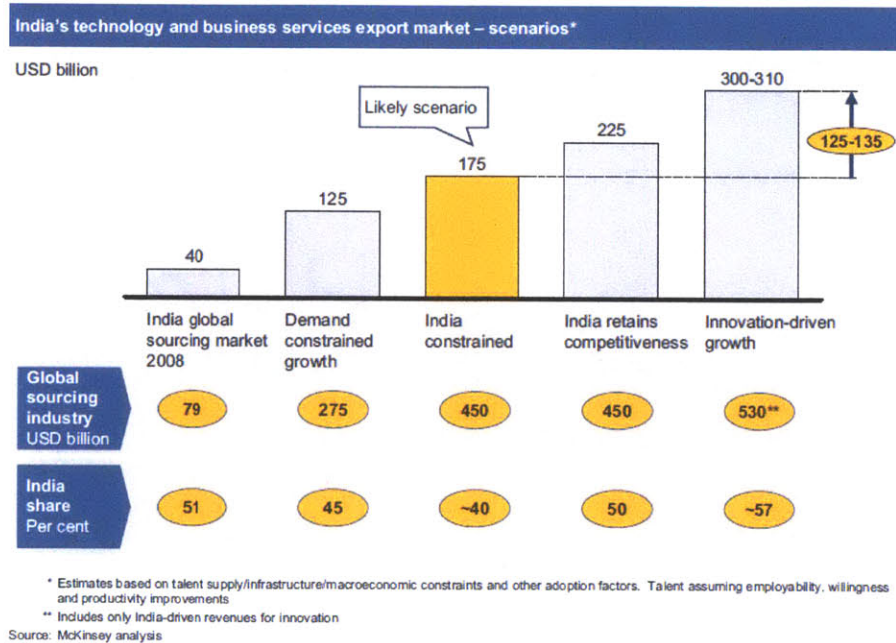


FIGURE 20: INDIA'S OPPORTUNITY AT RISK. SOURCE MCKINSEY ANALYSIS⁵

Further the report mentions that:

“India has made significant progress in the global sourcing services industry and captured over 50 per cent market share. However, it still contributes less than 1 per cent

of new patents in the world. Indian innovation clusters are still nascent compared with leading clusters such as Silicon Valley, Tokyo and Tel Aviv.”

There are different kinds of challenges while enhancing an IP and Software Product focus. Most importantly, the effort for such focus may need to be coordinated across multiple groups which include Government, NASSCOM, IT/Software companies, Academia, Managers and Employees. The subsequent chapters of this thesis deal with various factors that can help in fostering as IP and Product led focus.

4. THE PRODUCT FOCUS

India is now significant player when it comes to contributing to global software IP creation. However, only a handful of Indian software product companies have achieved significant global success. As documented in NASSCOM's Software Product study in India:

“Recent trends in market activity aided by a maturing ecosystem indicate that Indian software product businesses are now approaching an inflection point in their evolution. The next decade is expected to see a high growth for this segment, with the annual revenue aggregate of Indian software product businesses forecast to grow from USD 1.4 billion in FY2008 to USD 9.5 to 12 billion by FY2015. Over the last three years the annual revenue of Indian software product companies has grown by a CAGR of 44 percent. Over the past two decades, India has emerged as a global hub for product research and development (R&D) activity, especially in the technology industry. Today, there are over 600 multinational companies (MNCs) undertaking product R&D in their subsidiaries in India. Several Indian third-party service providers have also adapted the offshore model to offer outsourced product development services to assist clients in developing their IP. A few Indian firms have also developed their own product IP and are commercializing it through the licensing model. Yet, only a few Indian companies have managed to establish successful software product businesses.”¹⁴

¹⁴ NASSCOM, NASSCOM SOFTWARE PRODUCT STUDY, 2009

4.1.HISTORY OF PRODUCT DEVELOPMENT IN INDIA

India's software products companies date back to the early 1980s, when the leading IT service firms launched Unix-based compilers and office applications in the domestic market. The Indian Software Product industry earned \$113 million¹⁵ in FY1999, and grew to \$1.64¹⁵ billion in FY2009. The number of software product companies has grown from 102¹⁵ in FY1999 to 539¹⁵ in FY2009. This data does not include captive R&D centers of multinational companies. However, it needs to be noted that most of them are Small and Medium Business (SMB). On a per cent basis, India's revenues in FY2009 from software products stood at less than 5 per cent of overall IT/Software revenues.

While the product software companies have not yet created a brand or size for themselves that parallels the large multinational product companies, captive centers of multinationals have utilized the Indian talent pool effectively since mid 1990s to engineer products at lower cost. Similarly, there has been a mushrooming of Indian origin third party software product service providers since 1990s to provide software product R&D and support capabilities to the multinationals. These two advancements have worked well in introducing the product engineering capabilities in a largely IT focused talent pool.

¹⁵ T R MADAN MOHAN, MOVING INDIAN PRODUCT STORY INTO NEXT ORBIT (ACCESSED AT [HTTP://ECONOMICTIMES.INDIATIMES.COM](http://ECONOMICTIMES.INDIATIMES.COM)), NOV 2010

Addressable Market:

As reported in the NASSCOM Software Product Study¹⁴:

“Software products form the fastest growing segment of the global IT industry, with the software spends forecast to grow from USD 294 billion in FY 2008 to USD 537 billion in 2015. Over the same period, the addressable market for Indian software product businesses, representing the total spend on software in the top 10 of the 19 software product categories analyzed, is estimated to reach USD 290 to 315 billion.”

While the Products segment in India has not yet achieved a significant size, there is enough activity in the Product ecosystem to act as a starting point for a Product or IP led revolution.

4.2.HOW DO PRODUCT COMPANIES DIFFER FUNDAMENTALLY?

There are various differences in how a software product or a service firm manages its operations. However, in the last two decades times, many of the companies have started adopting hybrid approaches as well. As per Prof. Michael A. Cusumano, Author of book “The Business of Software”, software companies belong to three categories – products, services and hybrid. They may start up as Product Company, but may later evolve into a hybrid solution offerer, as is shown in the following figure.

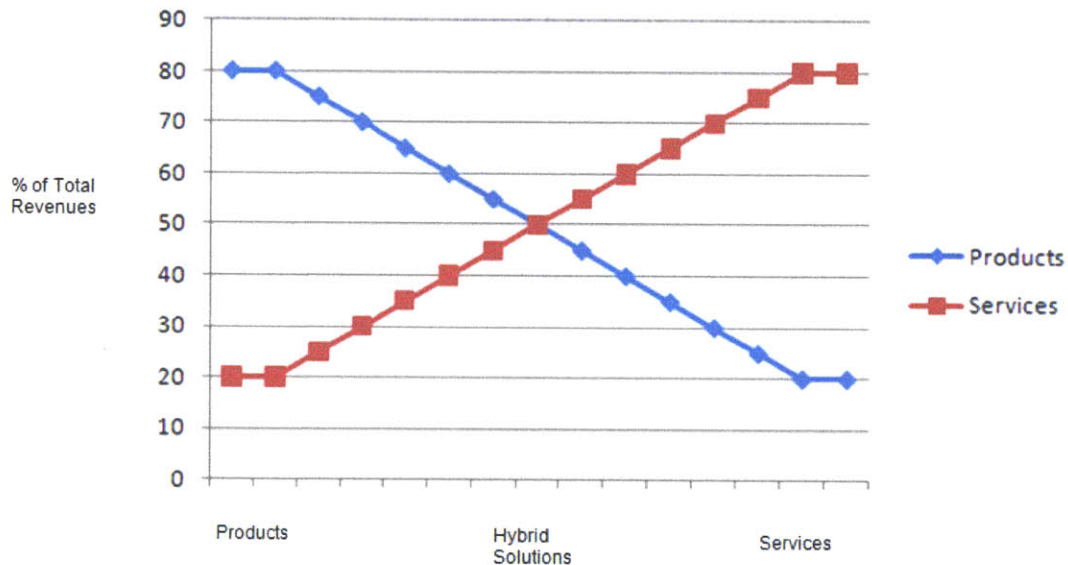


Figure 21: PROF. CUCUMANO’S DEPICTION OF NATURE OF SOFTWARE FIRMS¹⁶

¹⁶ MICHAEL A. CUSUMANO, THE BUSINESS OF SOFTWARE, 2003

Key differences in software product and service companies

1) Nature of work:

Prof. Cusumano:

“To be a product company means that majority of a firm’s revenues come in through sales of “shrink wrapped” software packages, named for the plastic wrapping that is used to cover boxes containing the floppy disks or CD-ROMs. In general it costs roughly the same to make one copy or one million copies of a product.”

However, it needs to be noted that with the advent of newer technologies such as “Software-as-a-service (SaaS) and virtualization, there have been some changes in the mode of delivery of some products to the end consumer. Software Service companies, on the contrary, get most of their revenues from custom built systems, and sometimes integrating software products in their solutions.

2) Start-up Capital:

Software service companies are generally revenue generating from the beginning. This is because most such companies start up with a promise of future service needs from potential customers. As a result, such companies do not have high start-up capital needs, and scale operations in proportion to increase in revenues and demand.

Software product companies, in contrast, have high start-up capital needs, as software products become revenue generating only after get sold in market. Generally, there is a period of six months to many years while such products get developed and finally hit

market. This period is capital intensive for such firms as they need to compensate the employees and manage other initial costs.

3) Focus on Intellectual Property and R&D:

Intellectual Property forms a primary asset for software product companies. Most of the time, such companies get evaluated by investors on the valuation of their IP assets. To maintain the focus on IP generation, companies invest significantly in R&D. Typically software product companies spend around 15% of their revenues on research and development.

Microsoft Corporation R&D Spend:¹⁷

As per Microsoft's form 10-K for 2010, during fiscal years 2010, 2009, and 2008, research and development expense was \$8.7 billion, \$9.0 billion, and \$8.2 billion, respectively. These amounts represented 14%, 15%, and 14%, respectively, of revenue in each of those years.

SAP R&D Spend:¹⁸

In 2009, SAP spent Euro 1.6 Billion in research and development, which constituted approximately 15% of the year's revenues.

On the contrary, service firms do not have a need to invest significantly in IP generation, as they create custom solutions for their customers. Since each custom solution is different from any previous work undertaken for other customers, IP generation does not

¹⁷ MICROSOFT 10-K FORM FOR 2010 (ACCESSED AT MICROSOFT WEBSITE)

¹⁸ SAP 10-K FORM FOR 2010 (ACCESSED AT SAP WEBSITE)

add value. However, such companies rely on process and operational innovation for maintaining margins, and divert their research efforts in this direction. Typically software services firms spend between 1 to 2 per cent of their yearly revenues on research and development.

Accenture R&D Spend:¹⁹

Accenture spent \$384 million, \$435 million and \$390 million in fiscal 2010, 2009 and 2008, respectively. These represent 1.6%, 1.8% and 1.5% of its overall revenues for these years respectively.

Infosys R&D Spend:²⁰

Infosys spent Rs. 430 crore and Rs. 236 crore in FY2010 and FY2009 respectively. These represent 2.1 % and 1.3 % of its overall revenues for these years, respectively.

¹⁹ ACCENTURE 10-K FORM FOR 2010 (ACCESSED AT ACCENTURE WEBSITE)

²⁰ INFOSYS 10-K FORM FOR 2010 (ACCESSED AT INFOSYS WEBSITE)

4) Financial Differences:

Three of the top software product and service companies (Fortune 500 list) have been analyzed to observe differences in the financials.

	Software Product Companies			Software Service Companies		
	Microsoft (2009)	Oracle (2010)	CA (2010)	IBM (2009)	CSC (2010)	SAIC (2010)
Revenues	58.43	23.25	4.27	95.75	16.73	10.84
Profits %	24.9	24.1	16.2	14	6.7	4.6
Mkt. Val. (mult. of rev.)	4.45	5.54	2.85	1.75	0.5	0.69

FIGURE 22: FINANCIAL DIFFERENCES BETWEEN PRODUCT AND SERVICE FIRMS

5) Market Driven versus Technology Driven

A software product company has to invest significantly in understanding the key markets and relevant dynamics that could alter the future environment in which the product may be launched. The fact that there is significant time gap between the conceptualization and launch of a product, a thorough understanding of the markets is a must. As a result, such companies are driven more by the market behavior than the availability of technology. There are examples of product companies releasing unfinished beta version of their products to market in a race to reach the market first. This not only helps in tapping the

market early, but also in understanding consumer's needs further to revise the product accordingly. It needs to be mentioned however, that breakthrough technologies carry the potential to disrupt unforeseen market scenarios.

On the contrary, a service firm must have capable technology expertise to appeal to the customers. Since custom solutions are created based on single customer requirements, there is no need to anticipate market requirements ahead of time. As such, the amount of uncertainty in being able to meet end users' needs is much lesser for service providers than the product firms.

6) **Contrasting Skills**

- **Marketing and Product Management** - Product companies incur significantly higher cost on marketing, and employ a larger marketing team versus service companies. Many companies have 'Product Managers' that report into marketing function. Such managers manage the product's lifecycle from conceptualization till retail, and form a critical skill requirement for a product company.
- **Operational and Project Management** – Service companies focus more on optimizing operations, effective human resource utilization and project management. As a result, Project and Program Management are key skill requirements for a service company.
- **Domain Understanding** - Product companies require deep understanding of the domain for which the product is being created. Domain experts are regularly employed who assist in understanding and communicating the requirements from consumer perspective. In contrast, Service providers are communicated software

business requirements by the customer, and are mainly contracted for providing technology solutions.

- **Programming Skills** - Software product development frequently requires operating system interfacing programming, which requires higher standards of programming expertise and education. Students majoring in computer science and related disciplines have a deeper understanding of such concepts. In contrast, software service frequently includes programming using Application Program Interface (API) provided by product vendors, and sometimes enhancing and maintaining pre-existing products and solutions. Such services may not require deep expertise and education.

7) Number of Employees:

Software product companies employ lower number of employees for same revenues generated. As a result revenue per employee is much higher for product companies.

Company	Year	Company Type	2010 Revenue/Employee
Microsoft	2009	Product	\$ 656,516
Oracle	2010	Product	\$221,428
IBM	2009	Hybrid	\$239,749
Accenture	2010	Service	\$105,637
CSC	2010	Service	\$171,276

FIGURE 23: REVENUE PER EMPLOYEE FOR LEADING PRODUCT AND SERVICE FIRMS

4.3. TRADITIONAL BARRIERS TO A PRODUCT FOCUS

For many years, experts have predicted that India has the potential to produce some world class companies in IT products. However, statistics do not back that assertion yet. Some of the traditional reasons creating barriers to a product focused approach have been:

- Over the last generation, the IT industry in India has gotten used to a service focus. This has happened mostly due to the fact that there has been enough business to be had without much risk in this segment. With no need to take unwarranted risks, product focus has been postponed.
- PhDs and people with advanced degree can contribute significantly in researching new technology areas and innovations. However, the PhD output of Indian universities has been as low as 3000 / year, which is a fraction of what U.S.A, China or leading European countries produce.
- Indians with advanced degrees from leading foreign universities have not found attractive jobs in Indian market traditionally. It needs to be mentioned however, that this scenario has seen changes in the last 5 years.
- India as a country spends less than 1% of its GDP on R&D activities, and similar statistics hold true for the IT/Software industry. The expenditure by leading IT/Software companies on R&D is significantly below their counterparts outside India, which have a more balanced product/service mix.
- Services deal mostly with doing what is required, while products deal mostly with anticipating what may be required and creating a market for it. The mindset of dealing with future uncertainties needs to take hold.

- IP protection and support infrastructure is still subjective.
- Sales, Marketing and Product Management are key functions of any product success.
While there are universities that produce quality candidates, these candidates get absorbed by large multinationals.
- Traditionally there has been lack of venture capital and seed capital in India. However this scenario is changing rapidly.

4.4. WHY PRODUCT FOCUS MAKES SENSE ‘NOW’?

Compared to the past, the environment is much more favorable for India to be IP focused. Some indicators are:

1. India (arguably) has one of the largest talent pools of engineers and technologists (producing more than 350,000 engineers every year). Although it needs to be noted that per NASSCOM estimates only about 25% of this talent is employable in the IT/Software industry. Secondly, product engineering requires different kind of skill sets than IT services.
2. NASSCOM understands this gap in skills and has set up finishing schools to bridge this gap.
3. The last few years have seen vibrant entrepreneurial spirit with many startups being launched. However most of these efforts have been service centric.
4. Over the last 3-4 years, there has been plenty of venture capital and private equity available for talented entrepreneurs with interesting business ideas and models.
5. Some of the recent advances in technology like cloud computing, Software-as-a-service, lowered storage and infrastructure costs, and virtualization have enabled entrepreneurs worldwide with the right business ideas to focus on software products without high initial capital investments.
6. NASSCOM and government departments have done exceedingly well to start venture incubation centers and mentorship initiatives.

7. Many multi-nationals have setup product development captive centers in India where they have started complete product development and support, and, as a result, there is now a much wider and deeper understanding of how products are built and marketed.
8. Last two decades has seen emergence of Indian companies which provide outsourced product engineering services. These companies nurture talent that is well versed with product dynamics, and can act as launching pads for budding entrepreneurs.
9. Domestic market for IT products in India has started growing rapidly in the last 3 years. Many startups can now focus on Indian market first, and then target global markets. The barrier of yesteryears of being away from the market may no longer hold true for long.

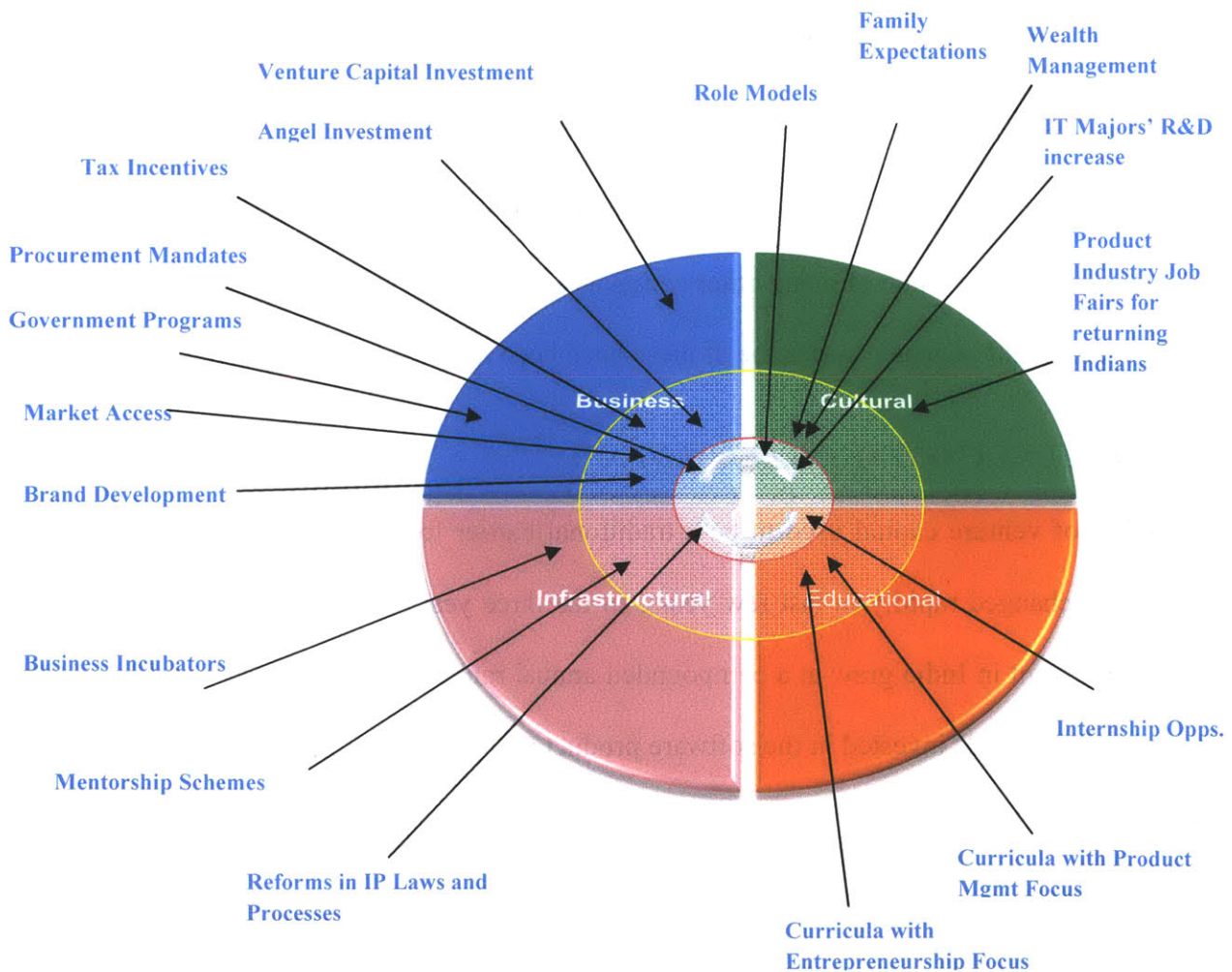
The factors mentioned above give us sufficient evidence to conclude that our second hypothesis stands true:

“Various ingredients and leading industry indicators are in place to suggest that Indian IT/Software industry is ready for an IP focused revolution”

However, just the presence of these ingredients cannot guarantee the growth of the nature that the ‘service’ industry has experienced in the past. For it to happen, various bits and pieces need to act together, and thereby form a well functioning and increasingly evolving ecosystem. In the next chapter, some of the factors that may be crucial in evolving such an ecosystem are studied in detail.

5. ENHANCING THE PRODUCT FOCUS

Some of the reasons of a lack of product focus are well known and documented. Some others are not so obvious and as part of this thesis, electronic surveys were conducted to understand such reasons. These questions aim to understand the reasons that influence entrepreneurs may in choosing to launch a service company over a product company. Such obvious and unobvious reasons have been shown below:



Innermost Circle – High Attention; Middle Circle – Improvements Required; Outer Circle – Under Control

FIGURE 24: ENHANCING THE PRODUCT FOCUS

5.1.BUSINESS

Various business reasons were analyzed, to understand how such measures impact the software product development ecosystem. As related by Pankaj Mishra in his article²¹ on Economic Times on 9th Nov, 2010:

“From around \$1.89 billion in revenues during 2008-2009, the Indian product firms’ revenues fell to \$1.64 billion during year ended March 2010, says Browne & Mohan, which analyzed 418 top product companies across Chennai, Bangalore, Pune, Delhi, Thiruvananthapuram, Bhubaneshwar, Chandigarh, Ahmedabad and Hyderabad.”

He further reported that nearly 100 software product start-ups closed operations in the past year, while the combined revenue of many other companies slipped, as research by a Bangalore-based firm. Reasons could be many, and some of these have been discussed in detail in this section.

5.1.1 VENTURE CAPITAL INVESTMENT

Availability of venture capital used to be a traditional barrier for Indian start-ups; however the scenario has changed rapidly in last few years. In the three years preceding 2007, total venture capital investment in India grew at a compounded annual rate of 42%²², and reached USD 543²² million in 2007. Funds invested in the software product segment grew slightly faster, by 43%²² to USD 156²² million.

²¹ PANKAJ MISHRA, PRODUCT COMPANIES WILT AS IT BUY FAVOURS MAJORS (ACCESSED AT ECONOMICTIMES.INDIATIMES.COM), NOV 2010

²² INDIA KNOWLEDGE@WHARTON, INDIA’S SOFTWARE INDUSTRY REBOOTS FOR AN EXPANDING MARKET (ACCESSED AT HTTP://KNOWLEDGE.WHARTON.UPENN.EDU), OCT 2008

As reported by Archana Rai in her article²³ ‘Young Tech Cos Stir Investor Interest’, in Economic Times on 6th April, 2010:

“Technology products designed to be used by multiple customers are emerging as a prime area of interest for venture investors in India. Roughly, half of the \$475 million invested by venture capitalists in 2009 went to information technology companies. In the period up to March 2010, a total of \$70 million was invested in companies that build technology products, according to Venture Intelligence, a research firm.”

She further quotes Shailendra Singh, Managing Director of Sequoia Capital India Advisors who says that:

“To build a \$1-million revenue base in a segment like IT services is a long process, but with one robust product a technology company can aim for 4-5 fold increase in revenues in a short span.”

In another Economic Times article²⁴ published on 31st Aug 2010, Harshal J Shah, CEO, Reliance Venture Asset Management shares another perspective which focuses on accessing technologies heavy R&D capital invested western countries:

“Domestic venture capital (VC) funds are subject to a cap on the amount they can invest in foreign start-ups at 10% of their total funds raised. Doing away with this cap will mean access to a multitude of technologies from the heavy R&D capital-invested West, which can be provided access to the huge markets in India through Indian entrepreneurs.”

²³ ARCHANA RAI, YOUNG TECH COS STIR INVESTOR INTEREST (ACCESSED AT ECONOMICTIMES.INDIATIMES.COM), APR 2010

²⁴ HARSHAL J SHAH, FOR INDIA’S NEXT ENTREPRENEURIAL(ACCESSED AT ECONOMICTIMES.INDIATIMES.COM), AUG 2010

The Indian VC firms have a fair shot at attracting higher returns for its Indian Limited Partners and to choose from Indian and foreign ideas — why should we curb their scope by erecting make-believe one-way economic barriers?”

Some of NASSCOM initiatives like NASSCOM India Innovation Fund²⁵, and NASSCOM ICICI (Industrial Credit and Investment Corporation of India) 100 crore innovation fund for Indian Startups²⁶, are steps in the right direction to help fund promising startups focused on innovation.

The availability of Venture Capital seems not to be a significant limiting factor, although browsing through various internet forums has revealed that the Indian private VC firms observe much higher selectivity than their counterparts at Silicon Valley.

5.1.2 ANGEL INVESTMENT

Traditionally, Indian start-ups have been funded mostly by (co) founders, their families or friends, and that to some extent explains the focus towards service based start-ups, which require minimal upfront capital. Angel Investing has not been as organized an avenue of financing in India, as late stage venture funding options or financing by private equity firms. In recent times though, some angel investment options have come up, however the overall amount invested is still small compared to overall market needs. Some of the private firms, networks or associations that provide or facilitate angel investments are:

- Go4Funding Angel Network

²⁵ EMERGE EDITOR, NASSCOM'S INDIA INNOVATION FUND MAKES DEBUT DEAL IN MITRA BIOTECH (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), NOV 2010

²⁶ RAJDEEP SEHRAWAT, NASSCOM & ICICI'S 100+ CRORE INNOVATION FUND FOR INDIAN STARTUPS (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), SEP 2007

- Helion VC
- Canaan partners
- Matrix Partners
- Erasmic
- Cipher Securities
- Darper
- Gujarat Venture Finance
- India Angel Network

Browsing through various Indian start-up focused internet forums and by conducting surveys, it is observed that even though there has been some activity on Angel Investment, there is still a long way to go before this channel of financing matures. Entrepreneurs also rate the importance of Angel investment higher than a late stage financing, as most of the times unavailability of initial funds that decides the focus (product or service) and success of a start-up.

In Silicon Valley, angels play a critical role in identifying and supporting a start-up and building it to a size where it catches the interest of venture capitalists. Pari Natarajan, CEO of Zinnov, estimates that the United States has 225,000 such angels, among which many support software product start-ups. India, he says, has about 225 angels, of which very few fund software product firms.

Angel Investment channels need more establishment focus than other established channels like venture capital. Investments at ideation stage involve much higher risks than at a stage when a start-up is revenue generating. Networking between High Net Worth Individuals (HNWI) - who

have higher appetite for risk, and budding entrepreneurs' needs to be facilitated through various industry forums.

5.1.3 TAX INCENTIVES

Section 3.2 describes the Software Technology parks (STPI) scheme, where the exporting software companies receive various tax incentives till a certain number of years after conception. However, since many of the early stage software product companies target the domestic market, the incentives do not apply to such companies. To incentivize entrepreneurs to establish software product companies, policy makers may need prioritize the product companies that cater to domestic markets along with export generating service and product companies, and provide similar taxation benefits.

Taxation benefits can be used as a tool by the policy makers to promote:

- Domestic Market Development – By giving tax incentives to domestic companies that buy from early phase Indian software product companies.
- Incentivize entrepreneurs to start product companies – By giving tax holidays for a certain number of years, irrespective of export or domestic nature of market.

In the article by Pankaj Mishra²¹, Pari Natarajan of advisory firm Zinnov Management Consulting is quoted as:

“Tax structure for software-as-a-service based products is still not clear. Is it being considered a service or a product? The tax structure is different for both in India at this point.”

Further clarity on tax laws as they relate to blurring lines between software services and products will also help entrepreneurs in utilizing the incentives appropriately. So far, the Indian Government has shown good foresight and strategy in fuelling the IT-BPO revolution by incentivizing the export focused companies with significant tax benefits. With a changing focus areas of IT-BPO industry, government needs to adopt similar steps as taken in the past, but rebalance the benefits towards high growth – high value initiatives.

5.1.4 PROCUREMENT MANDATES

Traditionally, government sourcing in many countries has played a prominent role in developing nascent industries. In Pankaj Mishra's article²¹ NR Narayana Murthy, chairman and founder of Infosys Technologies, is quoted:

“We will have to earmark projects which can be handled by smaller companies — we must set something apart for them to grow.”

In the same article, citing example of how France helped its smaller software companies three decades ago, Mr. Murthy mentions that India needs to learn from China, Brazil and France. He is quoted as:

“During the early 1970s, France awarded a global tender for a huge contract to an American company but said every project team should have at least one member from a local French IT firm.”

In Indian scenario, there are many government opportunities and large and proven vendors (Indian and Multinational) are automatic choices. However, government can mandate the

contract winners to subcontract some portions of software procurement from small and upcoming Indian product vendors.

It needs to be noted, however, that such mandates can work more efficiently in IT service scenario than a product license procurement scenario, as a hybrid of products achieving similar objectives could be costly and less efficient.

5.1.5 GOVERNMENT PROGRAMS

Government provides different channels for small businesses to avail loans at competitive interest rates. Various private banks also provide similar loans. However, most of these loans are meant for revenue generating companies, and may not apply for software companies at the ideation stage.

The Ministry of Science and Technology's Department of Scientific and Industrial Research (DSIR) has some attractive schemes for entrepreneurs interested in technology initiatives under Technopreneur Promotion Program (TePP). Some of these are:

- Micro Technopreneurship Support
- TePP Project Fund
- Seamless scale-up support for TePP
- Supplementary TePP fund

5.1.6 MARKET ACCESS

Due to the distance of India software product start ups from the global customers in terms of domain understanding, it is important for such companies to create products for domestic markets first. This can be done by targeting the SMB market, which is still not a focus area of

multinational product companies. Such SMBs have significantly different operational models than large Indian enterprises, and can be good learning grounds. At the same time efforts should be made to partner with large Indian service providers to gain access to large Indian enterprises.

NASSCOM provides forums for product entrepreneurs to network and present their offerings to Chief Information Officers (CIOs) of various enterprises through its yearly Product Conclave²⁷ events.

5.1.7 BRAND DEVELOPMENT

To target the SMB segment, it is important that the companies in this segment are made aware of companies and products relevant to them. Industry events like Product Conclave (as mentioned in section 5.1.6), can provide an initial focus. True brand recognition of Indian products will occur once the product segment becomes sizable and diversified. It needs to be noted that Indian software products in financial services segment have achieved significant awareness in domestic and international markets; however the market share of these products is still quite small.

²⁷ EMERGE EDITOR, COME TELL YOUR STORY TO CIOs AT NASSCOM PRODUCT CONCLAVE 2010! (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), OCT 2010

5.2.CULTURAL

In his book Krishnan⁹ answers “Why India is not able to be a source of major innovations despite being home to a large pool of individually talented people?” He says:

“Innovation is different from creativity. While individuals display creativity, transforming individual creativity into innovation is a social and collective process. Organizations and social networks constitute the arena where this process happens. Though government policy can provide incentives to overcome some of the barriers to this social process, other barriers that are embedded in social, cultural, and political fabric are more difficult to overcome.”

Some of the cultural aspects are discussed in the following subsections.

5.2.1 FAMILY EXPECTATIONS

One of the major barriers to technology based entrepreneurship in India has been lack of availability of risk capital. Non-technology-based entrepreneurship has thrived in the form of small business ownership, which requires significantly lower upfront capital investment. In the software technology area, service startups have had more acceptance than product startups as service startups can be revenue generating from conception. Adding to a high early mortality rate of technology initiatives, family and cultural expectations of being employed in low risk but high security jobs, reduces opportunities of otherwise meritorious ideas receiving fair consideration.

However, a lot has changed in the last decade. The following trends show that these cultural barriers will be reduced in the coming years:

- While India still has one of the largest population of people below poverty line, a dominant middle class has emerged during the last decade.
- Increasingly, middle class households are turning double income earning, especially in the metro areas.
- There is increased access to loans, which reduces the need to draw on family resources for seed funding.

5.2.2 ROLE MODELS

Positive role models increase any culture's ability to approve of a way of life or behavior. India has number of role models who created multi-billion dollar empires from scratch. (For example late Dhirubhai Ambani of Reliance Industries – petrochemicals and N. R. Narayana Murthy of Infosys – software services). Media (both print and Bollywood) has played a major role in helping others understand their journey to success. Since there are not many success stories of software product entrepreneurs yet, this space has lacked this kind of positive reinforcement in the minds of people, such as a Reliance Industries or an Infosys provides.

While the revenues related to software products from India are low, they are growing fast. Once this industry segment gains a critical mass and comes up with its first billion dollar software product enterprise, such role models will emerge.

5.2.3 MANAGING WEALTH

Traditionally, people in India have believed in saving money and passing it down generationally, as a means to financial security. This has led to a low risk – low reward culture. While saving is definitely encouraged, at an economic level, an excess of such practice can lead to lack of risk capital for growth initiatives.

Harshal J Shah²⁴ mentions in his article:

“To kick-start this next wave of entrepreneurship, we need to put our own capital to work — money should be a means to improving our lives and not be an end in itself. Most Indians have believed in capital preservation and hence, have had to forsake a multiplier in the form of capital growth. Among high net worth Indians, wealth is passed down generationally. This creates a disparity between the rich and the poor, which only gets wider, while simultaneously curbing our overall risk-taking appetite.”

One of the ways to reduce the practice of excessive generational handover of wealth could be to increase the wealth inheritance tax, which is still significantly lower in India as compared to many leading countries.

5.2.4 IT MAJORS' R&D SPENDING

As of 2009, India ranked 56th in the world on Economist Intelligence Unit's global rankings on innovation.²⁸ The number of patents applied was 0.467 per million people. As a comparison, rankings of some of the leading and competing economies in the world have been shown in the table below:

2004-2008 Innovation Performance

Country	Patents per Million	Innovation Performance Index	Rank
Japan	1274.533	10	1
USA	359.84	9.5	4
Germany	310.695	9.4	6
Russia	1.46	6.03	39
Brazil	0.88	5.71	49
China	0.529	5.39	54
India	0.467	5.31	56

Source : Economist Intelligence Unit, 2009

FIGURE 25: GLOBAL RANKINGS ON INNOVATION BY ECONOMIST INTELLIGENCE UNIT

The Economist Intelligence Unit is optimistic that India is expected to grow up in the rankings to rank 54 during the years 2009-2013. The innovation index provides country level data. A much faster growth in patent filing and acceptance in the area of software may be needed if the software product and IP initiatives are to contribute non-linearly in the long run.

Among the best placed to enhance the IP focus are the large software services firms. These firms not only carry sufficient cash reserves to fund such R&D, they also stand to gain in the long run on the investments made.

²⁸ ECONOMIST INTELLIGENCE UNIT, GLOBAL RANKINGS IN INNOVATION, 2009

Harshal J Shah²⁴ mentions in his article:

“Private companies are armed with a collective experience and war chest that is more than capable of creating Indian entrepreneurs. These in-house entrepreneurs can be incentivized to create small businesses out of divisions that enjoy management control from both the internal team and the mother ship. As the business grows, it can then be hived off into a separate entity, thereby creating a larger ecosystem of fresh talent, capital infusion, market opportunity and job availability. Incentivizing our existing private companies to take on the challenge of spotting and nurturing intrapreneurs to generate newer streams of shareholder value is something that will have far reaching consequences.”

Along similar lines, however, with focus more on IP generation, leading companies can tap on to the latest technology trends with their network of technology partners. Moreover, with their experience in serving global markets, such companies carry sufficient domain expertise to understand consumer needs.

We should note that increasing investment for R&D and IP generation will take years to bear fruit, and should be viewed as a longer term strategy. For a near term strategy, these companies must focus on acquisitions. Such strategy can focus on acquiring number of small product companies serving niche areas. By acquiring carefully selected smaller product companies, the service firms can create a product portfolio that best synergizes with the existing service offerings. Such portfolio of products will give service companies access to an existing customer base and market. With valuable learnings from market and product operations, such service

companies can be well placed to kick start a larger and more organic effort towards product and IP development.

Indian software companies have grown much more organically than their peers in other countries. Moreover, the scope of acquiring other companies has so far been limited to larger service firms acquiring smaller ones. Acquisition of predominantly product companies for tapping their capabilities in R&D and IP generation will require a culture change and increased risk taking effort from the leading service companies.

5.2.5 PRODUCT INDUSTRY JOB FAIRS FOR RETURNING INDIANS

A significant contribution in the software product segment of the service dominated IT/Software industry has come from the Indian Diaspora settled in western countries. During 1980's and 90's, a trend of "Brain Drain" was observed when many leading professionals in India left for higher paying jobs in western countries. This was fuelled by lack of job opportunities in India, and higher demand of technical professionals in western countries. This scenario has changed significantly during the last decade, when increasing number of foreign multinationals have set up offices. This trend, coupled with ever-growing demand from India's software services industry has opened up many high paying job opportunities for returning Indians. This trend called "Reverse Brain Drain" is growing rapidly in India.

As indicated in an article²⁹ by Zubair Ahmed in BBC News, more than 60,000 Indian professionals went back to India, and a majority were IT professionals. Many of the recent returns have been facilitated by job fairs targeting Indians interested in returning. "India Calling

²⁹ ZUBAIR AHMED, US 'REVERSE BRAIN DRAIN' TO INDIA NOW IN FULL SWING (ACCESSED AT [HTTP://WWW.BBC.CO.UK](http://www.bbc.co.uk)), AUG 2010

US Job Fair”³⁰ is one such example, which is promoted by shine.com. Websites like shine.com provide a platform that not helps candidates connect with recruiting companies, but also with other support systems like schools (for children) and real estate.

A large segment of the companies that attract the returning Indians are large multinationals with regional offices in India. Some of the companies participating for the 2010 event are:



FIGURE 26: A SAMPLE LIST OF RECRUITING COMPANIES AT SHINE.COM³⁰

While the lists in such career fairs include large Multinational and Indian companies, early-phase Indian product companies need to tap such channels as well. Returnees with experience working in entrepreneurial settings and relevant product life cycle management skills can be targeted.

³⁰ INDIA CALLING US JOB FAIR (ACCESSED AT [HTTP://INDIACALLING.SHINE.COM](http://INDIACALLING.SHINE.COM))

5.3. EDUCATIONAL

India's educational system has delivered well in the past in supporting a growing economy's needs. In the field of engineering, in 1980s it produced more engineers than were required. However the scenario in the two decades has changed significantly, owing to an ever increasing demand from the IT/Software services industry. As per FICCI survey¹³, the IT industry had a requirement of 350,000 engineers per annum, against 150,000 that are available per annum. The survey estimated a shortfall of 500,000 technology professionals by 2010. Such shortfalls can affect not only overall industry revenues, but also reduce competitiveness. While quantity impacts the software services sector, product sector is mostly impacted by quality, and hence more focus has been laid on discussing quality in the following sub sections.

5.3.1 PRACTICAL CURRICULUM

The educational curriculum at many universities is outdated and is in need of external reviews, and subsequent periodic reviews to ensure that it stays current. Moreover the overall learning process has stayed highly theoretical.

The National Knowledge Commission's Report to the Nation³¹ for 2006-2009 notes:

“The syllabi of courses in universities, which remains unchanged for decades, needs to be upgraded constantly and revised frequently. The laws of inertia reinforced by resistance to change must be overcome. Universities should be required to revise or restructure curricula at least once in three years. These revisions must be subjected to outside peer review before implementation.”

³¹ NATIONAL KNOWLEDGE COMMISSION, REPORT TO THE NATION (ACCESSED AT [HTTP://WWW.AICTE-INDIA.ORG](http://www.aicte-india.org)), 2009

While learning sciences and humanities may not necessitate a highly practical curriculum, universities preparing students to undertake technology careers can do well by laying an equal emphasis on practical aspects of learning as is done for theoretical aspects. This is especially important for engineering and management degree granting institutions, which are located in or around technology hubs, and have observed increased activity in technology entrepreneurial initiatives. While top ranking institutions like IITs and IIMs have taken the right steps in this direction, the number of students these institutions graduate still is a small fraction of the overall number required. Steps that can be taken to balance the overall learning experience by increasing practical learning include:

- Create cross networks among educational institutions and local technology companies to facilitate student applications for internship opportunities with software product companies. Such internships should be integrated with classroom learning experience, to ensure that there is a two-way flow of information.
- Such internships will expose interested students to work with leading and upcoming software product companies, and place them better for employment with such companies or their own entrepreneurial initiatives.

Internship granting companies will stand to gain by:

- Tapping into the university network and resources through interning students
- Possibly employing the interns as full time employees after an evaluation period of three to six months
- Promoting awareness for the company as a future employer, among the student network

- Tapping into alternate technology and business ideas

5.3.2 *CURRICULA WITH PRODUCT MANAGEMENT FOCUS*

In software entrepreneurial setups, where every employee performs many roles, a Product Manager is expected to understand and participate in all the areas of product development that is conceptualization, engineering, roll out, marketing, sales and finance. Some of the soft skills like effective and timely communication, time management and management of conflicting priorities are a must requirement for a Product Manager. As a result, a Product Manager's experience and/or education in multiple disciplines is a must for a start-up to succeed.

Based on Annual Product Management and Marketing survey conducted by Pragmatic Marketing, the following results on a Product Manager's activities provide a good insight into the extent of interdisciplinary understanding a Product Manager needs to have.

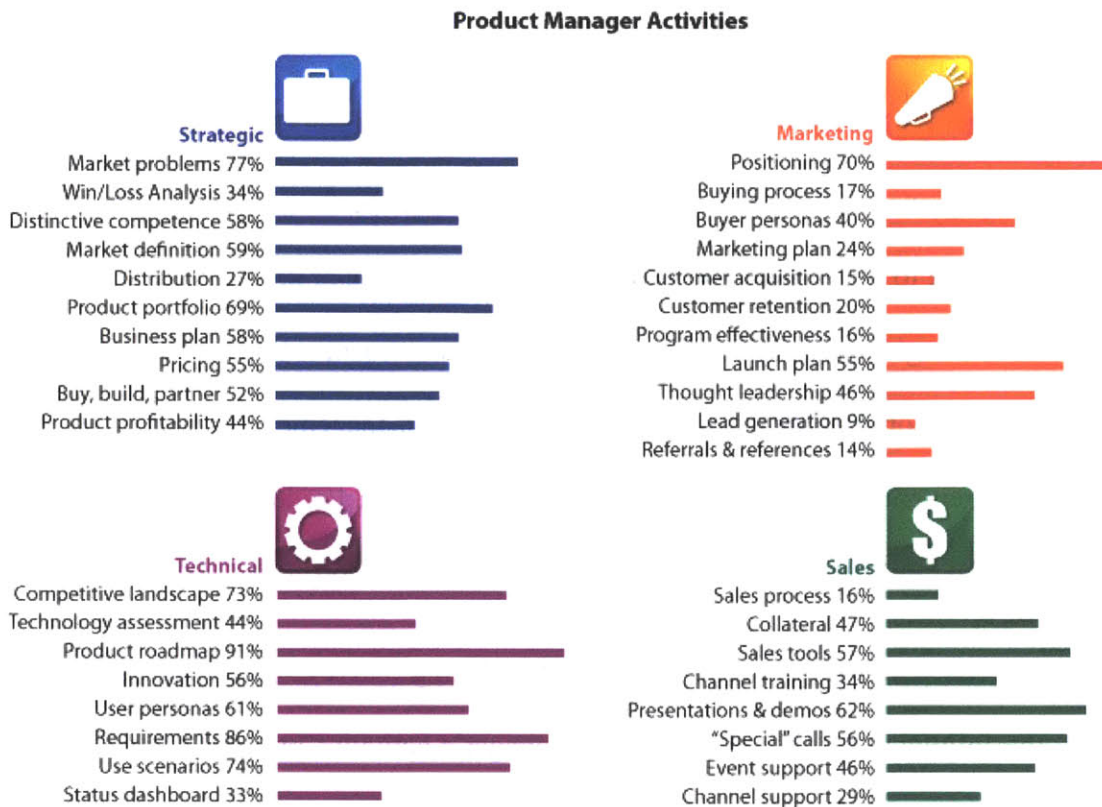


FIGURE 27: ANNUAL PRODUCT MANAGEMENT AND MARKETING SURVEY BY PRAGMATIC MARKETING³²

In the Indian scenario, universities which have multiple schools, and can provide interdisciplinary education in business and computer engineering, can significantly contribute by:

- Creating a ‘Software Product Management’ track for computer engineering students, by allowing them to enroll for business electives related with marketing, sales and finance.

³² PRAGMATIC MARKETING, 2010 ANNUAL PRODUCT MANAGEMENT AND MARKETING SURVEY (ACCESSED AT [HTTPS://WWW.PRAGMATICMARKETING.COM](https://www.pragmaticmarketing.com)), 2010

- Creating a ‘Software Product Management’ track for business school students, by allowing them to enroll for engineering electives.
- Create certification programs for people employed as early stage Product Managers
- Create certification programs for people who wish to switch from IT Services to Product Management

5.3.3 CURRICULA WITH ENTREPRENURIAL FOCUS

While numerous educational institutions grant business degrees and diplomas, there are not many that help students specialize in technology entrepreneurship. Educational institutions that are a part of ecosystems of major software technology hubs should offer certifications and coursework that deals with different aspects of product and IP centric entrepreneurship.

Some of the popular courses³³ related to technology and entrepreneurship at MIT Sloan School of Management offer practical means for students to experience what is learned, often through projects with local companies. Similar and more locally adapted courses can be offered as electives in Indian educational institutions that are located in technology hubs. Some of such courses at MIT are:

- Entrepreneurship Lab
- New Enterprises
- Dilemmas in Founding New Ventures
- How to Develop Breakthrough Products and Services
- Organizing for Innovative Product Development
- The Business of Software and Digital Platforms

³³ MIT SLOAN COURSE CATALOG (ACCESSED AT [HTTPS://SLOANBID.MIT.EDU](https://sloanbid.mit.edu))

- Innovation Teams
- Digital Innovations
- Entrepreneurship and Prosperity in Low Income Countries
- Entrepreneurial Finance
- Basic Business Law for Entrepreneur and Manager

While the leading few educational institutions like IIMs and IITs do have significant entrepreneurship focus in curriculum, the same cannot be said of the rest.

5.4.INFRASTRUCTURAL

There may appear to be several infrastructural barriers in place for assisting a software product and IP revolution, but on a deeper analysis, there seems to be sufficient infrastructure in place to provide fuel for the initial evolution of this sector. Once the software product industry reaches a critical mass, infrastructural support services will gain increasing financial incentive to scale further. There has been significant progress in the last decade with rapid increase at least in incubation centers and other entrepreneurship supporting initiatives; however reforms in IP protection may need to be performed soon for entrepreneurs to feel secure about the most premium asset of a software product company. Some of the important infrastructural aspects have been discussed in the following sub sections.

5.4.1 BUSINESS INCUBATOR SERVICES

Pravin Bhadada, authoring an article³⁴ on Sandhill.com has mentioned that there are about 40 incubation centers in India and 28 software companies were incubated in 2008 from some of these university supported incubators.

³⁴ PRAVIN BHADADA, R&D: THE WAY FORWARD (ACCESSED AT [HTTP://WWW.SANDHILL.COM](http://www.sandhill.com)), 2009

Some of the leading incubation and innovation centers which support software technology start-ups are mentioned in the following table:

Incubation Institute	Established	Features
IIM Ahmedabad ³⁵	2004 (support from National Science and Technology Entrepreneurship Development (NSTEDB), DST)	<p>Idea Mining – In partnership with Economic Times, DST and IIM Ahmedabad CIIE</p> <p>Discover Stars – Student teams participate, compete, get mentored and earn cash awards</p> <p>Mentoring – Innovative start ups get mentored</p> <p>Incubation – Mentorship, living and working space, investment up to Rs. 5 Lakh</p> <p>Seed Fund – Deal sizes up to Rs. 25 lakh</p>
IIM Bangalore ³⁶	2002	<p>Mentoring</p> <p>Physical Resources - Flexible Office Space, Computers, Phones, Communication Link, Library</p> <p>Shared Support - Finance, Legal, Secretarial, HR, IT, Hosting, Accounting, Tax, Marketing</p> <p>Seed Funding</p>
IIM Lucknow ³⁷		Mentorship

³⁵ CENTRE FOR INNOVATION INCUBATION AND ENTREPRENEURSHIP (ACCESSED AT [HTTP://WWW.CIIEINDIA.ORG](http://www.ciieindia.org))

³⁶ NADATHUR S. RAGHAVAN CENTRE FOR ENTREPRENEURIAL LEARNING (ACCESSED AT [HTTP://WWW.NSRCEL.ORG/HOME/INCUBATION](http://www.nsr cel.org/home/incubation))

		Other Incubation Services
IIT Bombay ³⁸	2004 (support from NSTEDB, DST)	<p>Physical Resources – Office Space, Computers, Communication Link</p> <p>Shared Resources - Print/Scan/Photo Copy/Fax, Servers, Meeting Rooms, Teleconference, Pantry</p> <p>Mentoring</p> <p>Networking Events</p> <p>Seed Funding</p>
IIT Kanpur ³⁹	Collaboration with Small Industries Development Bank of India (SIDBI)	<p>Physical Resources – Office Space, Computers, Communication Link, In Campus Accommodation</p> <p>Shared Resources - Print/Scan/Photo Copy/Fax, Servers, Meeting Rooms, Teleconference, Pantry</p> <p>Mentoring - Faculty, Business Plan Review</p> <p>Networking Events</p> <p>Seed Funding</p>

³⁷ ABHIYAN - THE ENTREPRENEURSHIP CELL OF IIM LUCKNOW (ACCESSED AT [HTTP://ABHIYANIIML.COM](http://abhiyaniiml.com))

³⁸ SOCIETY FOR INNOVATION AND ENTREPRENEURSHIP, IIT BOMBAY (ACCESSED AT [HTTP://SINEIITB.ORG](http://sineiitb.org))

³⁹ SIDBI INNOVATION AND INCUBATION CENTRE, IIT KANPUR (ACCESSED AT [HTTP://WWW.IITK.AC.IN/SIIC/INDEX.HTML](http://www.iitk.ac.in/siic/index.html))

India Angel Network ⁴⁰	2010 (support from NSTEDB, DST)	Physical Resources – Office Space, Computers etc Shared Services – Legal, Accounting, Marketing, IPR, HR Mentoring – From industry veterans Seed Funding Assistance – Government and Angels Training – Taxation, IP, Accounting
KIIT technology Business Incubator ⁴¹	2009(support from NSTEDB, DST)	Physical Resources – Office Space, Computers etc Shared Resources - Print/Scan/Photo Copy/Fax, Servers, Meeting Rooms, Teleconference Mentoring

It is observed that the leading incubation centers provide much more than just office space and shared physical resources, and actively assist entrepreneurs with shared business services, business plan reviews, mentorship initiatives, networking initiatives and seed funding. However, the number of such centers will need to be scaled higher to anticipate and match the growth of start-ups, now that the software product industry is at a rapid growth inflection point.

⁴⁰ INDIAN ANGEL NETWORK (ACCESSED AT [HTTP://WWW.INDIANANGELNETWORK.COM](http://www.indianangelnetwork.com))

⁴¹ KIIT TECHNOLOGY BUSINESS INCUBATOR (ACCESSED AT [HTTP://WWW.KIITINCUBATOR.IN](http://www.kiitincubator.in))

5.4.2 MENTORSHIP SCHEMES

Incubators associated with educational institutes provide mentorship services mostly through faculty interaction and some companies networked well with institute's academic circle. Moreover, most of the companies mentored belong to the category of 'just conceived'. Companies which cross the initial incubation stage and reach critical size and revenue, need further assistance and continued guidance to enhance their chances of continued success. This is where successful entrepreneurs who have crossed the initial turbulent stages can offer valuable advice. They can be involved through informal channels to take part in once in a quarter health checks, or can be more formally employed as part time directors in advisory capacity.

NASSCOM has launched mentorship programs in different cities through its Emerge Forum, which have assisted many companies. Through this program, the mentee companies are generally engaged with a mentor for three to six months spending at least 1.5 hours a month. Many among the mentorship panels are serial-entrepreneurs, who carry experience to assist with varied issues new entrepreneurs may face.

5.4.3 REFORMS IN IP LAWS

In India, the patent legislation is governed by the Patent Act, 1970. This act was a result of some previous patent legislations including the Patents and Designs Protection Act, 1872 and the Protection of Inventions Act, 1883. Patents are enforced by way of suits for infringement. Article 34 of Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement, which was signed at the Uruguay round of the World Trade Organization (WTO), shifts the burden of proof on the defendant in a suit for infringement. This means that the defendant in such suit will be presumed guilty unless it is proved to be on the contrary. There were significant amendments

introduced to the Indian patent Law in 2002 to align it with the TRIPs agreement. Despite favorable amendments, there are still significant challenges in the enforcements of these laws.

Some of these challenges are:

- Lack of awareness of patent basics in judiciary, and lack of judicial precedents
- Lack of awareness among the enforcement agencies
- Patent infringement is a civil offense, and cannot be tried in criminal courts
- No timeframe is prescribed for legal recourse. Cases can take up to 10 years to resolve
- The Indian patent office has a growing backlog, which may discourage new filings for patents

Other than enforcement, some administrative challenges like lack of a complete electronic database of Patents can lead to unintended patent infringements. The fact that important amendments have been made to the relevant laws in the last decade has demonstrated an increased commitment from the authorities. However, the next phase of reforms need to actively deal with efficient enforcement aspects.

6 CONCLUSION

We started off by understanding how the IT/Software industry has evolved in India in the past decades. While the industry began more in response to tapping ever increasing demand for cheap labor, combined with an educated over supply in India, it has blossomed well to reach levels where cheaper labor is just one part of overall value proposition for countries planning to outsource to India. Other factors like process maturity, maturing business continuity, disaster recovery planning, and existence of companies with more than a generation of experience have helped companies in other countries choose India as a top IT/Software outsourcing destination, for reasons beyond cost. Chapter 3 explains the past, present and expected behavior of the industry with the help of System Dynamics loops. Through some of these loops, we observe that that a linear growth model is not sustainable for the industry in long run. The cracks have started to show, and will only get deeper as time passes. At the end of chapter 3, we conclude that we have observed sufficient evidence to prove our first hypothesis correct:

“Service centric growth of Indian IT/Software Industry is not sustainable in the long run, and can lead to an early maturity”.

In chapter 4, we develop an understanding of the Software Product segment of the IT/Software industry. We start off by observing the industry segment as it stands today, look into the historical factors that have kept the segment in the shadow of the larger ‘service’ segment, and then observe key differences between the nature product and service companies. Then we look into some of the traditional barriers that have kept the growth of product segment in check. At the end of the chapter, we discuss some of the key leading indications that help us reasonably conclude the second hypothesis:

“Various ingredients and leading industry indicators are in place to suggest that Indian IT/Software industry is ready for an IP focused revolution”.

At the end of chapter 4, we conclude that just the presence of the right ingredients cannot guarantee the growth of the nature that the ‘service’ industry has experienced in the past. Various bits and pieces need act together, and to form a well functioning and increasingly evolving ecosystem, to be able to achieve that.

In chapter 5, we discuss various factors that may be crucial in evolving such an ecosystem. These factors are broadly classified as Business, Cultural, Educational and Infrastructural. Among the Business factors, it is noted that Venture Capital industry is maturing fast in India and it is expected to ramp up to keep pace with the need. Venture Capital companies are in the business of evaluating and financially investing in candidates exhibiting higher potential for success, and reduce their risk by generally refraining from investing at ‘seed’ stage. Since such companies employ professionals who generally have years of experience in identifying high potential companies, it can be concluded that a worthy early stage (not seed stage though) product company stands a good chance to meet its capital requirements. However, the same cannot be assumed about Angel Investment in India. Companies which need seed capital, face an uphill task.

The Indian government has played a key role in the growth of ‘service’ segment of industry, by allowing favorable tax terms to export oriented companies. In the past few years, there has been pressure on the government to eliminate these benefits as the industry has now matured, and government loses significant tax revenue in continuing these benefits. While elimination or reduction in tax benefits may be justified, the government may need to keep the benefits in place

for some strategic segments in the IT/Software industry, which promise higher growth but pose significant challenges to entrepreneurs. Permitting such benefits for Software Product and IP focused companies can be an important factor in bringing entrepreneurs' focus in the segment.

We observed that one of the challenges that early stage software product companies face in India is its distance to global markets. This challenge poses a hindrance in terms of understanding the market accurately, to be able to develop products targeting that market. Government mandates allowing smaller parts of large software procurement contracts to smaller product firms can help smaller companies target domestic market. There is definitely an element of risk, as some unproven products may get employed as part of government IT infrastructure. To reduce risk on this front, a central team of technologists can be set up for technical evaluation of such products. Anticipated high growth in domestic SMB market for IT/Software is also expected to encourage software product entrepreneurs to develop their products for domestic market. The SMB segment in India has not been very lucrative for large multinational product companies yet.

We further noted that there have been some cultural aspects influencing Indian entrepreneurs not to focus on starting product companies. Cultural changes are the slowest to achieve, and are expected to pose a lower barrier once the industry segment reaches a critical mass, and there are some success stories. Perhaps the greatest contribution at this time can be made by the leading IT service firms, who carry sufficient cash to pursue shorter term inorganic routes to acquire companies operating in niche product areas, and then supplement that by more organic longer term initiatives including increased R&D spend.

The Indian educational system requires significant changes not only to assist the IT Service industry in terms of meeting pure 'numbers of engineers' based demand, but also to assist a

nascent Software Product segment in hiring engineers with more specialized skills. Measures taken by the government and industry associations are steps in the right direction, but such measures may need to scale up and may pose to be the most challenging aspects. Infrastructure of business incubators and the breadth of services (including mentorship and assistance with seed funding) provided by these incubators is a great positive. IP laws have changed for the better post 2005; however the enforcement of these laws still remains a concern.

After analyzing the existing ecosystem for supporting software product and IP focused companies, and noting where the ecosystem might be headed in the next few years, it is observed that the third hypothesis may not be entirely true. Our initial hypothesis was:

“An IP focused effort needs to effectively tap into available support ecosystem, and the support system may not be able to evolve at an effective pace, for software product related revenues to add to overall industry revenues in a significant way”.

It is noted that even though a lot may need to be achieved for the ecosystem to evolve in a way that is needed, there are many aspects of the ecosystem which have started functioning well. Some aspects will require a similar level of commitment from various stakeholders as was seen during the early days of IT Services industry, while the rest will evolve over time.

If we look back at history, the news of first ‘Billion Dollar’ software Product Company from India may launch a frantic race to reach the landmark among peer companies, as was witnessed when Tata Consultancy Services reached this landmark among the service companies.

7 APPENDIX A: SURVEY QUESTIONNAIRE

1. Company Info Exit this survey

	17%
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*1. Name

*2. Company Name

3. Company Website

*4. Company HQ

City/Town:

State/Province:

Country:

*5. Year Founded

*6. Number of founders

Next

Your vision about company's offerings, before start up.

*1. Offering Type

- Products Only
- Services Only
- Products Supported by Services
- Services Leading to Products
- Other (please specify)

*2. Primary focus area(s). E.g. - Mobile Apps

3. Primary Geography Targetted

- APAC
- EMEA
- India
- Americas
- Other (please specify)

3. Offerings (post start up)

50%

If the company is older than two years, then please answer these questions for a snapshot at the end of second year.

If the company is younger than two years, then please answer these questions for a current snapshot.

*1. Offering Type

- Products Only
- Services Only
- Products Supported by Services
- Services Leading to Products
- Other (please specify)

2. Product/Service Revenue % Distribution (approximate)

*3. Primary focus area(s). E.g. - Mobile Apps

*4. Primary Geography (Highest Revenue Generating)

- APAC
- EMEA
- India
- Americas
- Other (please specify)

Prev

Next

Following questions relate to initial financing.

1. Seed Capital Sources

- Self Funded
- Family & Friends
- Angel Investor(s)
- VCs
- Other (please specify)

2. Please specify approximate % distribution across the sources (if more than one source)

3. Succeeding Round(s) Finance Sources (any further financing within the first two years)

- Self Funded
- Family & Friends
- Angel Investor(s)
- VCs
- Other (please specify)

4. Please specify approximate % distribution across the sources (if more than one source)

*1. Prior to launch, did you consider launching a product focussed company instead of a services focussed one?

- Yes, I considered launching product for a while
- No, I envisioned it as a technology services business
- No, I envisioned it as a technology enabled business

2. If the answer is 'yes' to the question above, then please rate the following possible reasons for not moving ahead with a product launch.

	Very Low	Low	Medium	High	Very High	N/A
High initial capital investment	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Lack of professional investment infrastructure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Higher lead time to revenue generation	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Lack of product engineering skillsets in local job market	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Higher risks associated with product development	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Accounting laws favor service revenue	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Taxation laws favor service revenue	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
IP laws inadequate to protect possible infringement	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Lack of start up incubation infrastructure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Lower predictability of product markets	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Other (please specify)	<input type="text"/>					

6. Final Thoughts



1. What would you consider as the single largest obstacle faced by Entrepreneurs in India today?

2. If there is one thing that government and industry associations could do to promote product focussed companies, what could that be?

8 APPENDIX B: ABBREVIATIONS

API	APPLICATION PROGRAM INTERFACE
BPO	BUSINESS PROCESS OUTSOURCING
CA	COMPUTER ASSOCIATES
CAGR	COMPOUND ANNUAL GROWTH RATE
CEO	CHIEF EXECUTIVE OFFICER
CIO	CHIEF INFORMATION OFFICER
CMC	COMPUTER MAINTENANCE COMPANY
CMM	CAPABILITY MATURITY MODEL
CMU	CARNEGIE MELLON UNIVERSITY
CSC	COMPUTER SCIENCES CORPORATION
DSIR	DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
DST	DEPARTMENT OF SCIENCE AND TECHNOLOGY
EBITDA	EARNINGS BEFORE INTEREST TAXES DEPRECIATION AND AMORTIZATION
ERNET	EDUCATION AND RESEARCH NETWORK
FICCI	FEDERATION OF INDIAN CHAMBERS OF COMMERCE AND INDUSTRY
GDP	GROSS DOMESTIC PRODUCT
HNWI	HIGH NET WORTH INDIVIDUAL
HR	HUMAN RESOURCE
IBM	INTERNATIONAL BUSINESS MACHINES
ICICI	INDUSTRIAL CREDIT AND INVESTMENT CORPORATION OF INDIA
IGNOU	INDRA GANDHI NATIONAL OPEN UNIVERSITY
IIM	INDIAN INSTITUTE OF MANAGEMENT

IEC	ELECTRO TECHNICAL COMMISSION
IIT	INDIAN INSTITUTE OF TECHNOLOGY
IIIT	INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
IMF	INTERNATIONAL MONETARY FUND
IP	INTELLECTUAL PROPERTY
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
IT	INFORMATION TECHNOLOGY
ITES	INFORMATION TECHNOLOGY ENABLED SERVICES
MHRD	MINISTRY OF HUMAN RESOURCE DEVELOPMENT
MIT	MASSACHUSETTS INSTITUTE OF TECHNOLOGY
MNC	MULTINATIONAL COMPANY
NASSCOM	NATIONAL ASSOCIATION OF SOFTWARE AND SERVICES COMPANIES
NIC	NATIONAL INFORMATICS CENTRE
NICNET	NATIONAL INFORMATICS CENTRE NETWORK
PCMM	PEOPLE CAPABILITY MATURITY MODEL
PPP	PURCHASING POWER PARITY
R&D	RESEARCH AND DEVELOPMENT
SAAS	SOFTWARE AS A SERVICE
SAIC	SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SDM	SYSTEM DESIGN AND MANAGEMENT
SEEPZ	SANTACRUZ ELECTRONICS EXPORT PROCESSING ZONE
SEI	SOFTWARE ENGINEERING INSTITUTE
SIDBI	SMALL INDUSTRIES DEVELOPMENT BANK OF INDIA

SMB	SMALL AND MEDIUM BUSINESS
NSTEDB	NATIONAL SCIENCE AND TECHNOLOGY ENTREPRENEURSHIP DEVELOPMENT BOARD
STP	SOFTWARE TECHNOLOGY PARK
STPI	SOFTWARE TECHNOLOGY PARKS OF INDIA
TEPP	TECHNOPRENEUR PROMOTION PROGRAM
TQM	TOTAL QUALITY MANAGEMENT
TRIPs	TRADE-RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS
US	UNITED STATES
VC	VENTURE CAPITAL
WTO	WORLD TRADE ORGANIZATION

9 APPENDIX C: REFERENCES

- 1 NASSCOM, STRATEGIC REVIEW 2011-THE IT-BPO SECTOR IN INDIA, 2011
- 2 IMF, WORLD ECONOMIC OUTLOOK DATABASE, APRIL
- 3 NASSCOM, STRATEGIC REVIEW 2009 – THE IT-BPO SECTOR IN INDIA, 2009
- 4 NASSCOM AND A T KEARNEY, LOCATION FOR IT-BPO GROWTH, 2008
- 5 NASSCOM AND MCKINSEY AND COMPANY, PERSPECTIVE 2020 : TRANSFORM BUSINESS,
TRANSFORM INDIA, 2009
- 6 WEBSITE OF MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
([HTTP://WWW.MIT.GOV.IN/CONTENT/EXPORT-PROMOTION-SCHEMES-DPL-ELEC](http://www.mit.gov.in/content/export-promotion-schemes-dpl-elec))
- 7 RAJNEESH DE, SRIKANTH R P, QUALITY BECOMES KEY TO INDIA'S IT GOALS
(ACCESSED AT [HTTP://WWW.EXPRESSCOMPUTERONLINE.COM](http://www.expresscomputeronline.com)), DEC 2001
- 8 NASSCOM, STRATEGIC REVIEW 2010 – INDIAN IT-BPO SECTOR, 2010
- 9 RISHIKESHA T. KRISHNAN, FROM JUGAAD TO SYSTEMIC INNOVATION – THE CHALLENGE
FOR INDIA, 2010
- 10 ARUP ROYCHOUDHARY AND SUPANTHA MUKHERJEE, INDIA IT ATTRITION SEEN EASING
(ACCESSED AT [WWW.REUTERS.COM](http://www.reuters.com)), SEP 2010
- 11 CHANDAN DAS, ITS OFFICIAL : ATTRITION IS INDIA INC'S BIGGEST ENEMY (ACCESSED AT
[WWW.NEARSHOREAMERICAS.COM](http://www.nearshoreamericas.com)), OCT 2010
- 12 BINU PAUL, POST RECESSION, ATTRITION TROUBLES IT INDUSTRY THE MOST
(ACCESSED AT [WWW.SILICONINDIA.COM](http://www.siliconindia.com)), SEP 2010
- 13 FICCI, SURVEY ON EMERGING SKILL SHORTAGES IN INDIAN INDUSTRY, 2007
- 14 NASSCOM, NASSCOM SOFTWARE PRODUCT STUDY, 2009
- 15 T R MADAN MOHAN, MOVING INDIAN PRODUCT STORY INTO NEXT ORBIT (ACCESSED AT
[HTTP://ECONOMICTIMES.INDIATIMES.COM](http://economictimes.indiatimes.com)), NOV 2010

- 16** MICHAEL A. CUSUMANO, THE BUSINESS OF SOFTWARE, 2003
- 17** MICROSOFT 10-K FORM FOR 2010 (ACCESSED AT MICROSOFT WEBSITE)
- 18** SAP 10-K FORM FOR 2010 (ACCESSED AT SAP WEBSITE)
- 19** ACCENTURE 10-K FORM FOR 2010 (ACCESSED AT ACCENTURE WEBSITE)
- 20** INFOSYS 10-K FORM FOR 2010 (ACCESSED AT INFOSYS WEBSITE)
- 21** PANKAJ MISHRA, PRODUCT COMPANIES WILT AS IT BUY FAVOURS MAJORS (ACCESSED AT [HTTP://ECONOMICTIMES.INDIATIMES.COM](http://ECONOMICTIMES.INDIATIMES.COM)), NOV 2010
- 22** INDIA KNOWLEDGE@WHARTON, INDIA'S SOFTWARE INDUSTRY REBOOTS FOR AN EXPANDING MARKET (ACCESSED AT [HTTP://KNOWLEDGE.WHARTON.UPENN.EDU](http://KNOWLEDGE.WHARTON.UPENN.EDU)), OCT 2008
- 23** ARCHANA RAI, YOUNG TECH COS STIR INVESTOR INTEREST (ACCESSED AT ECONOMICTIMES.INDIATIMES.COM), APR 2010
- 24** HARSHAL J SHAH, FOR INDIA'S NEXT ENTREPRENEURIAL (ACCESSED AT ECONOMICTIMES.INDIATIMES.COM), AUG 2010
- 25** EMERGE EDITOR, NASSCOM'S INDIA INNOVATION FUND MAKES DEBUT DEAL IN MITRA BIOTECH (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), NOV 2010
- 26** RAJDEEP SEHRAWAT, NASSCOM & ICICI'S 100+ CRORE INNOVATION FUND FOR INDIAN STARTUPS (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), SEP 2007
- 27** EMERGE EDITOR, COME TELL YOUR STORY TO CIOS AT NASSCOM PRODUCT CONCLAVE 2010! (ACCESSED AT [HTTP://EMERGE.NASSCOM.IN](http://EMERGE.NASSCOM.IN)), OCT 2010
- 28** ECONOMIST INTELLIGENCE UNIT, GLOBAL RANKINGS IN INNOVATION, 2009
- 29** ZUBAIR AHMED, US 'REVERSE BRAIN DRAIN' TO INDIA NOW IN FULL SWING (ACCESSED AT [HTTP://WWW.BBC.CO.UK](http://WWW.BBC.CO.UK)), AUG 2010
- 30** INDIA CALLING US JOB FAIR (ACCESSED AT [HTTP://INDIACALLING.SHINE.COM](http://INDIACALLING.SHINE.COM))
- 31** NATIONAL KNOWLEDGE COMMISSION, REPORT TO THE NATION (ACCESSED AT

- [HTTP://WWW.AICTE-INDIA.ORG](http://www.aicte-india.org)), 2009
- 32** PRAGMATIC MARKETING, 2010 ANNUAL PRODUCT MANAGEMENT AND MARKETING SURVEY (ACCESSED AT [HTTPS://WWW.PRAGMATICMARKETING.COM](https://www.pragmaticmarketing.com)), 2010
- 33** MIT SLOAN COURSE CATALOG (ACCESSED AT [HTTPS://SLOANBID.MIT.EDU](https://sloanbid.mit.edu))
- 34** PRAVIN BHADADA, R&D: THE WAY FORWARD (ACCESSED AT [HTTP://WWW.SANDHILL.COM](http://www.sandhill.com)), 2009
- 35** CENTRE FOR INNOVATION INCUBATION AND ENTREPRENEURSHIP, IIM AHMEDABAD,(ACCESSED AT [HTTP://WWW.CIIINDIA.ORG](http://www.ciiindia.org))
- 36** NADATHUR S. RAGHAVAN CENTRE FOR ENTREPRENEURIAL LEARNING, IIM BANGALORE (ACCESSED AT [HTTP://WWW.NSRCEL.ORG/HOME/INCUBATION](http://www.nsrce.org/home/incubation))
- 37** ABHIYAN - THE ENTREPRENEURSHIP CELL OF IIM LUCKNOW (ACCESSED AT [HTTP://ABHIYANIIML.COM](http://abhiyaniiml.com))
- 38** SOCIETY FOR INNOVATION AND ENTREPRENEURSHIP, IIT BOMBAY (ACCESSED AT [HTTP://SINEIITB.ORG](http://sineiitb.org))
- 39** SIDBI INNOVATION AND INCUBATION CENTRE, IIT KANPUR (ACCESSED AT [HTTP://WWW.IITK.AC.IN/SIIC/INDEX.HTML](http://www.iitk.ac.in/siic/index.html))
- 40** INDIAN ANGEL NETWORK (ACCESSED AT [HTTP://WWW.INDIANANGELNETWORK.COM](http://www.indianangelnetwork.com))
- 41** KIIT TECHNOLOGY BUSINESS INCUBATOR (ACCESSED AT [HTTP://WWW.KIITINCUBATOR.IN](http://www.kiitincubator.in))