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Information technology in India

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Information Technology in India

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HONORS THESIS ABSTRACT
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ABSTRACT:

It was in my knowledge that India always possessed a large pool of technical talent within itself, which was comparable to world standards. A question that I always dwelled over was that, even though India was one of the giants in Software development, what were the underlying reasons for not implementing Software technology within it's own business settings?

The engine behind the growth of the IT industry in India has been software exports. This industry has been growing at an annual rate of 30% since 1988. There are no signs of abatement in that growth rate. There are an abundance of software programmers and skilled management personnel in India and this would attract more international companies to form tie-ups. Computers in India have a longer life period compared to developed countries. Due to the low cost of maintenance and high cost of new hardware, Indians tend to use computers for many years. The crucial advantage for India will be ability to leap frog over many intermediate technologies and use the latest. The high cost of hardware forces programmers to develop cost-effective and efficient programs that get

the best out of the machines. Adaptability is an essential part of Indian culture; hence, there should not be any cultural factors that could inhibit the growth of information technology. Companies have been reluctant to pursue the massive domestic market, choosing instead to pursue established international markets for Information Technology.

Another potential problem within the Indian software sector is the shift from an emphasis on programmers to a need for higher-level skilled personnel. There is a need for quality analysts able to understand and decide what a business is all about and how to best represent it in computing terms. Furthermore, it can be said that programming is incidental and routine and will soon be performed by computers using programming generators. Lastly, there seems to be an overemphasis on software product and an under-emphasis on the software development process, where primitive design and old production techniques are still being used.

The current growth patterns of the industry are truly remarkable, and the industry's strengths by far outweigh its weaknesses. As long as software companies manage their growth effectively and apply their resources to further develop and nurture the developing domestic market, they may be poised to claim first place in the global software industry.

In order for a country to survive in the 21st Century, it will be crucial for the country to be technologically developed. Globalization and telecommunications are based on the fact that the entire Universe will be at par with standards for communicating with each other. A country like India, where the population is surpassing a billion people, it has to go through fundamental changes in the sectors of economy, infrastructure, and technology.

It was in my knowledge that India always possessed a large pool of technical talent within itself, which was comparable to world standards. A question that I always dwelled over was that, even though India was one of the giants in Software development, then what were the underlying reasons for not implementing Software technology within it's own business settings. In this paper, I will first give an overview of the current Information Technology industry in India. After which I will discuss my research, and then eventually, analyze the possible reasons for my hypothesis.

OVERVIEW OF THE CURRENT SITUATION

Privatization and Deregulation :

Since gaining independence from the British in 1947, the Indian economy has been highly regulated. The founding fathers of India opted for a mixed economy, but they wanted the public sector to occupy the commanding heights of the Indian economy. Like

in other socialist countries, this experiment failed. The public sector in India had become a drain on the country's resources (1).

While the 1980s saw India enter the consciousness of emerging market investors and traders, it was only in 1991 that the country's leaders significantly stepped up efforts to loosen the government's substantial hold on the economy and prompted a significant business response. With the introduction of measures liberalizing this market, India was set solidly on the path to growth. India's economic growth averaged 5.6 percent annually during 1980s. Monopoly power and a lack of foreign competition in some industrial sectors deprived India of technological advancements, modern methods of production and incentives to improve quality and efficiency, prior to the 1990s (1).

In 1991 the Department of Telecommunications(DoT) announced that it would allow the private sector to get into value added services like E-mail, bulletin board services(BBS) and radio paging, but it still maintained its stronghold on voice telephone services. In 1994, following the release of the Telecom Policy, DoT announced opening of the voice and the cellular market to the private sector. However, there is no denying the fact that the Indian consumer for the first time has more than one choice in choosing Telecom services (7).

For many U.S. firms, India's huge and growing population is the primary attraction. India is expected to become the world's most populous nation by 2060. In addition, twenty-three Indian cities each have more than one million inhabitants. India is the largest market in South Asia, representing a vast, largely untapped market for many

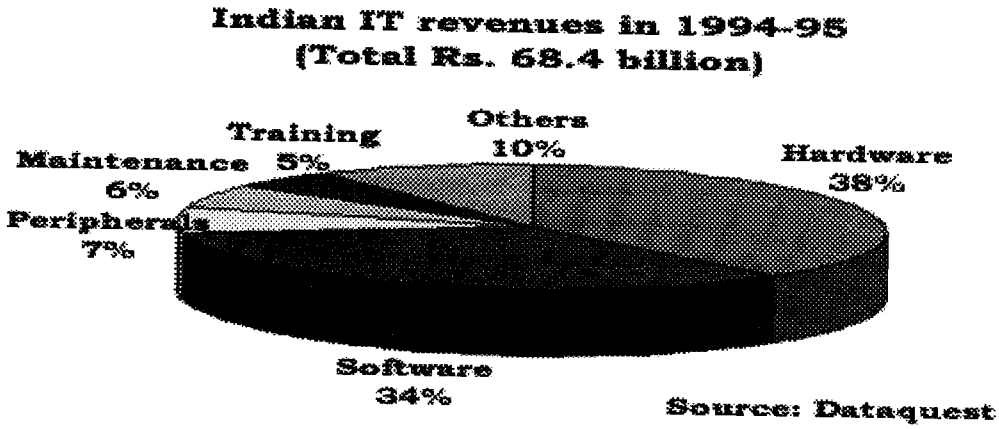
American goods and services. Much of the momentum for change is generated by the private sector, both foreign and domestic (2).

As the Indian market opens up, Indian companies are looking to strategic alliances with U.S. and other foreign firms to take advantage of the reforms at home and export opportunities abroad. U.S. firms are looking at less expensive cities in the secondary urban areas and at infrastructure projects in cities and regions that are likely to grow faster than major metropolitan areas. The U.S. government also has played a role in encouraging policy reforms in such areas in intellectual property rights and investment (1).

Infrastructural Development in India :

Indian plans call for spending at least $100 billion for infrastructure development between 1992 and 2000, of which at least $50 billion would be spent in the transportation sector. India is exploring the possibilities of infrastructure development through privatization, i.e., BOT (build-own-transfer) or BOO (build-own-operate) arrangements. Development of India's infrastructure is crucial to its growth strategy. Although its infrastructure is extensive, it is inadequate to meet current demands, let alone rapidly growing future needs (6).

Information Technology in India :



India's $9 billion Information Technologies market registered a 25 percent annual growth during the early 1990s, which makes it one of the fastest-growing in the world. U.S. exports of these products and services to India increased in 1994 to $360 million because of the government's economic liberalization policies. Although India imports only a small percentage of information technology products from the U.S., American manufacturers supply a significant portion of India's needs through overseas subsidiary operations and joint ventures with Indian partners (3).

Information Services in India :

This market is modest but growing-$715 million in 1993. Indian custom software development is the largest sub-sector of the country's information services industry, exporting $330 million in 1993. India's services market is not as open as those in developed countries. Still, providers of on-line services and professional services have opportunities as India modernizes its telecommunications infrastructure and financial

sector. It's Information superhighway will include data and large file transfer capability, electronic data interchange and video conferencing (8).

The Software Industry :

The software industry in India is a key strength in the broader realm of Information Technology. The rate of growth of software companies has been tremendous, rising from only seven software firms to more than 130 in the past five years. This fact alone is a major reason why the information technology industry has been averaging a 25% growth rate since 1991. The bulk of the software industry's expansion can be attributed to export demand in the United States as well as Western Europe. More significant is the fact that India has an enormous supply of skilled computer personnel compared to the U.S., where demand for such workers is greater than supply. The result is that labor costs are one tenth of those in the U.S., thus giving India a comparative advantage. This advantage translated into approximately $500 million in revenues during 1995 for Indian software firms - a figure which is expected to grow to $1 billion by the end of 1996, according to a recent World Bank report (9).

The Indian software industry can be classified in three different categories. The first category constitutes companies which sell to a multitude of foreign companies, such as airline giants Swissair and Lufthansa; many foreign companies source most, if not all of their Information Technology needs from Indian software companies. The second category is made up of Indian software firms that export products and IT solutions using Western companies as intermediaries. The third category is joint ventures which combine

complimentary resources of both Indian and Western firms to serve both export and domestic markets. One strength of the Indian software industry is the diversity of services and products available. They range from clerical support and data processing to technical support and highly sophisticated software systems. The country's largest developer of sophisticated software systems is Tata Consulting Services (TCS). The company employs approximately 4,000 software professionals and had a turnover of $113 million in 1994. Some of its foreign multinational clients include Prudential and J.P. Morgan. At the other end of the spectrum are companies like Netquest that employ less than fifty employees. Netquest has carved out a niche for itself in the global marketplace by offering technical support at a significant discount compared to the rates charged in other nations (8).

Best prospects for U.S. software exports to India include data communications software, local and wide area networking software, multimedia products, relational database management systems, CAD/CAM/CAE software, on-line transaction processing software, and object-oriented tools. The market for packaged software is estimated to have increased 21 percent annually between 1991 and 1993, reaching $80 million. Major American software firms that do business in India, through distributors or joint ventures include Microsoft, WordPerfect, Lotus, Novel, Borland and Intergraph (11).

The Hardware Industry :

During the 1990s, India's $1.1 billion computer equipment market grew at a much faster pace (31 percent annually) than any other information technology sector. Demand is particularly strong for personal computers, workstations and small scale, multi-user

systems. U.S. computer exports to India have risen 6.5 percent annually since 1990, to reach $94 million in 1994. India's hardware industry is import-intensive, so the high cost of imported components results in high-priced computers. Indian suppliers, often in conjunction with foreign hardware manufacturers (many from the U.S.), produce a broad range of personal computers, notebook computers, minicomputers, supercomputers, large-scale computers and peripheral products. Despite a varied product base, Indian industry continues to import specialized computer systems (11).

While the software sector in India is flourishing with more than 100,000 programmers (and still growing), the hardware industry is lagging behind, but nevertheless worthy of comment. Since India lacks the expertise necessary to manufacture internal computer components, its focus is on the assembly of computers. Indian hardware firms must therefore import computer components from abroad, the result being high domestic prices for computer hardware in India. Hardware prices are, on average, twice as much in India than in the United States. A major reason for this is the hefty duties levied on imported parts. The significant price differentials has led to the formation of a black market for smuggled computer equipment from such places as Singapore and Taiwan. Some of the world's largest computer manufacturers have realized the enormous potential of the Indian market and have located their manufacturing facilities within the country in the advent of government sympathy towards foreign investors. Such well known companies include: Acer, Compaq, Dell, Digital, and Hewlett-Packard. Two of these companies have formed strategic alliances with Indian firms to make-up the two largest

computer manufacturers in the country: Hewlett-Packard has joined forces with Hindustan Computer Ltd. and Acer has teamed up with Wipro.

The hardware market in India exceeded $1 billion in 1994. The bulk of the market is comprised of PC as opposed to large platform sales. There are approximately 600,000 PCs in use within the Indian market today. To put things in perspective, with a population of over 900 million people, that translates into one PC for every 1,500 people. In the United States the ratio is one to three. This represents tremendous untapped potential for those companies willing to invest in the Indian market. Of course, this must be considered in light of the overall poverty of the Indian population (10).

Within the hardware industry, one particular product segment has experienced significant growth: local area network (LAN) servers. Currently, 20% of PCs are connected to LANs, and the figure is poised to continue to grow; it has been said that, in addition to design, India's strength lies in its ability to integrate computers. Certainly the LAN server sector is heading in the right direction; the growth rate in 1993-94 was 152%. Indian firms are also now specializing in the production of peripherals such as disk drives, keyboards, power supplies and printers. Thus, we can see how India is overcoming a weakness, its inability to manufacture computer components, by concentrating on something they are good at -- design and integration of computers.

E-mail Services in India :

As elsewhere in the world, in India too e-mail services were initially introduced for academic institutions through ERNET -a UN funded project. ERNET was a project

initially funded by United Nations Development Projects and later on subsidized by the Government of India. It offered subsidized access to educational and research institutions in India. ERNET worked and still works reasonably well, allowing Indian researchers and students access to Internet (13).

Following Telecom liberalization, the Government of India (GOI) allowed private sector organizations to provide e-mail services to end users. However, it restricted their scope of operation through refusal to give permission to provide direct Internet access, and high capital entry barrier in the form of a high licensing fees.

Common Operating Systems and Programming Languages :

There are approximately a dozen different high-level programming languages used in India. Two primary languages used in the Indian software industry include Oracle and QuickBuild, which are fourth generation programming languages (4GL). These 4GLs are the main languages used by programmers due to Western demand for higher level software technologies. (Domestic demand for higher level software technologies is quite low.) The costs associated with the use of such 4GLs are very high and as a result Indian software firms wishing to use such languages need support from their clients in the West. It can be noted that 4GLs are very important software tools for programmers because of their ability to develop and produce other software.

The demand for custom-written software is growing quickly in Western markets as companies want to have software written especially for them to give them a particular competitive advantage. The application of 4GLs provides programmers with the tools

necessary to serve these needs. Examples of 4GL applications include the use of QuickBuild to build a telephone inquiries system and the Ingres 4GL to build a hospital management package. With over 120,000 PCs connected to LANs in the Indian economy, most of the networking is in the Unix and Netware operating systems, with the Unix system serving primarily the CAD/CAM and database users (11).

Analysis of the U.S. Software Market :

With the arrival of very powerful microprocessors like the Intel 80386, the US $50 billion software and service market is undergoing a transition. The International BusinessWeek (11 May 1987) carried a special report on the changes taking place in the structure of the software industry and the emerging trends. It noted that out of the top ten software companies, seven used to specialized in mainframe software. These companies have now been compelled to move into the PC and minicomputer areas. The US market for PC and minicomputer application software is estimated at US $21 billion and is expected to grow at about 13 percent a year. Database programs are emphasized as a main growth area as most business and service industries require data storage and retrieval systems.

New application packages now use artificial intelligence (AI) techniques, take more man-days to develop and cost more to produce. There is a considerable amount of research work being put into upgrading programming techniques and set up 'CASE' (Computer-Aided Software Engineering) cells to speed up program generation. The emergence of new operating systems (such as OS/2) and open systems approach places

and even greater demand for new packaged programs and networking software. Obviously such a software scene is dynamic, with innovation and development being key elements for success (11).

RESEARCH AND FINDINGS

Over the Summer of 1997, I was in India. I had already decided on my topic for my thesis in the preceding semester. My capstone advisor assisted me in designing a survey. I were to get the answers from 10 Organization's in India.

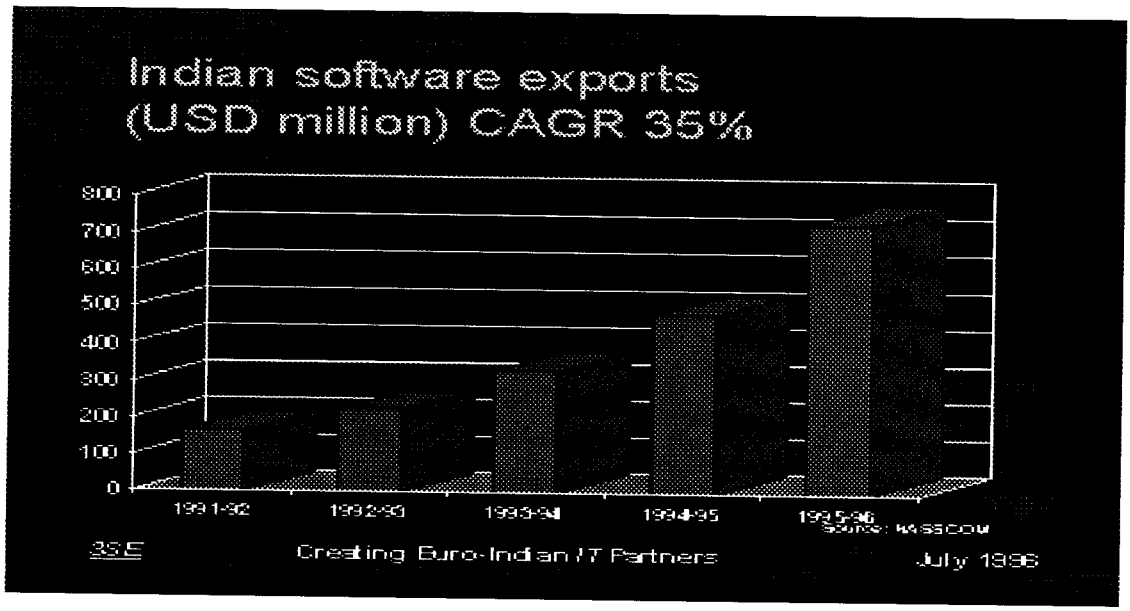
Most companies did believe the fact that computers will, and are making business more easier to manage. Large companies already have mainframe applications. They do realize the advantages of Client-server, but may cannot justify the costs associated with the transfer. About 50% of business processes are labor associated, and it is very cost effective for companies to run in that manner. Most of the companies did not believe that processing speeds or data transmission rates had any significance to them at this time.

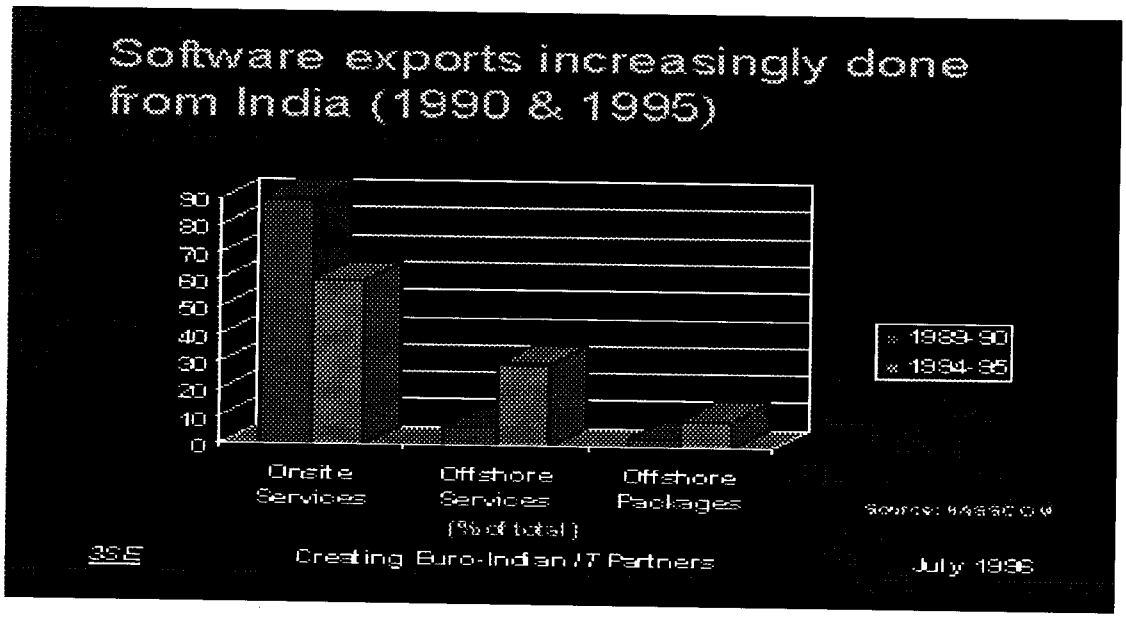
Companies that used Client-server applications preferred PC's with processing speeds of over 133Mhz. Companies use ORACLE, Power-Builder, Fox-Pro and Microsoft to develop applications. They do believe that they would have to be at par with technology, if they are going to compete in the Global market.

In the remaining paper I have tried to analyze the IT Industry in India; and the reasons for my hypothesis to hold true, given the current scenario.

REASONS FOR INDIA TO EXPORT SOFTWARE

Incentives for Software export units :





The foreign investment policy in the software sector is liberal and repatriation of investment and profits are freely allowed. There are no restrictions on foreign collaboration agreements or foreign technicians working in India. Investment upto 100% is allowed automatically for non-resident Indians and overseas companies owned by them.

Other cases, including setting up of fully owned subsidiaries in India, are specifically approved by the Foreign Investment Promotion Board (4).

Special incentives are given to investors setting up operations with a focus on the export market. Software Technology Park (STP) units, Export Oriented units (EOU) and units in the Export Promotion Zones (EPZ) can avail of these benefits. The investor is free to choose the location under the first two schemes. A unit under the EPZ must be located in one of seven designated zones (12).

Some of the incentives offered are :

- Foreign equity upto 100% is permissible.
- Except for prohibited items, duty free import of all inputs, including capital goods is permitted.
- Exemption from payment of corporate income tax for a block of five years in the first eight years of operation.
- After the five year block period, profits on export would continue to be exempt, as per norms specified.
- Units in the STP scheme have to meet an export obligation in net foreign exchange terms equal to one and a half times the CIF value of hardware imported and the wage bill incurred in India.
- Such units can also import telematic equipment without import duty. There is no export obligation on these imports.
- Units in the EOU/EPZ schemes have to meet a value addition of 60% (the ratio of net foreign exchange earned to gross foreign exchange earned).

- Access to domestic market upto 25% of the production in value terms, after meeting the export obligation/ value addition (5).

ANALYSIS OF THE CURRENT SITUATION

IT Strengths :

India's strengths in the Information Technology arena are-:

- Availability of unlimited pool of cheap and talented software personnel
- Presence of the biggest English speaking population after the United States
- Availability of western educated management personnel
- Lack of regulation in the software industry
- Burgeoning middle class of nearly 150 million consumers
- No baggage of outdated software technology
- Time difference advantage with countries like the United States

IT manufacturing in India is going to be on the lines of assembling components manufactured in other countries. Since the import duty on hardware components is relatively high, there is a lot of smuggling of components from countries like Singapore and Taiwan into India. Most big Indian firms have formed strategic alliances with international companies like Hewlett-Packard and Acer. Hence investing in PC manufacturing is not expected produce immediate profits. However the LAN and the peripheral markets are growing at fantastic rates and could be good investment areas

for companies which are looking to invest in overseas IT manufacturing. Based on the software export growth in India, offshore programming ventures will continue to remain profitable for the next few years (14).

IT Weaknesses :

India's biggest weakness would be in the area of telecommunication infrastructure. India's telecommunication infrastructure is poor compared even to developing countries. The reason behind this has been the state monopoly over telecommunication in India. Most public sector agencies have become white elephants. Until recently, Indian politicians were hesitant to antagonize the powerful labor unions of the state run telecommunication agencies. In 1994, there were half hearted attempts to sell some of the shares in these firms. The employees promptly went on strike.

The government has taken a bold step in allowing private competition to the Department of Telecommunication(DoT). In order for India to become a strong player in the IT market, the government has to dismantle bureaucratic controls which discourage foreign firms from investing in India. The lack of infrastructure forces companies to invest on high cost items like satellite links and high speed lines. Not all firms would be able to afford such capital costs both in terms of money and time. This cost could be a major restraint for the IT industry. The government has to become a major customer for the IT industry to encourage the growth of the domestic software and hardware industry. At present, there is a great deal of resistance in government circles against investing in computers.

Impact on the (non-IT) globally competing firm :

Following the liberalization era which began in 1991, India became one of the big emerging markets. At the same time the government realizing the importance of Information Technology started reducing the import duties and excise taxes on fax machines and computers. Prior to this, these items were considered a luxury and taxed at the highest possible rate. Suddenly computers became affordable to not only businesses but the average middle class consumer as well. As the sale of computers grew, there was a whole industry built around technical support for software and hardware. The availability of a vast resource of technical personnel made it a buyer's market in terms of competitive pricing.

One of the most important change has been the recognition of the computer as a valuable management tool. Today computers are viewed as a necessity by most firms irrespective of their size. Personnel turnover is still a major problem faced by Indian industries. Some industries are insisting on new recruits to sign employment contracts with them. Salaries in most of the firms for IT professionals are still low because of the abundant availability. The computer revolution has finally hit India. The impact on the globally competing firm irrespective whether it is an International firm or an Indian firm remains to be seen (15).

Analysis Of On-line services :

Below are the major factors that have led to the marginalization of private sector e-mail service providers in India (16):

- Lack of further telecom liberalization
- Lack of strong telecom infrastructure
- Narrow base of home PC owners
- Lack of a proper revenue stream
- Lack of organizational support

Future of On-line services :

Government-owned monopolies like VSNL are usually not equipped to cater to the consumer market. In India, the Government has for a long time been toying with the idea of allowing the private sector to provide direct Internet access. So far no explicit policy has been made available to the public, probably as much due to bureaucratic distaste for any kind of change with respect to deregulation as it is to the fluidity of the political situation for the last couple of years.

E-mail service providers expect the Department of Telecommunication (DOT) to allow the private sector to provide Web access later this year. VSNL is expected to remain the only gateway to India and act as a backbone to smaller Internet service providers. There is also a lot of lobbying going on to reduce the licensing fee requirement which supposedly DOT has pegged at Rs. 30 lakhs. If the Government of India actually lowers the licensing fee requirement and allows the private sector to provide direct Internet access, many more are expected to enter the market and the e-mail market scenario in

India is probably going to undergo a sea change. Otherwise, most of the existing e-mail services will likely end up as money-losing propositions, and the popularity of the WWW in India will remain at its present low end (13).

CONCLUSION

India has traditionally fought automation due to pro-labor policies followed by successive governments. The IT industry received its initial boost in 1986, when the government reduced duties on imported computer components. The computer manufacturing industry took off with many companies diversifying into assembling computers. Following the dismantling of the license system in 1991, foreign manufacturing companies started to invest into India (17).

The engine behind the growth of the IT industry in India has been software exports. This industry has been growing at an annual rate of 30% since 1988. There are no signs of abatement in that growth rate. There are an abundance of software programmers and skilled management personnel in India and this would attract more international companies to form tie-ups.

The customer base for hardware is split equally between the government and the private sector firms. The customer base transcends the type of industry. Embracing information technology is still slow in many government agencies, especially at the regional level. Though these agencies invest in computers, they do not use computer for anything else other than word processing. Many government agencies cannot hire computer professionals due to employment freezes (14).

Computers in India have a longer life period compared to developed countries. Due to the low cost of maintenance and high cost of new hardware, Indians tend to use computers for many years. The crucial advantage for India will be ability to leapfrog over many intermediate technologies and use the latest. The high cost of hardware forces programmers to develop cost-effective and efficient programs that get the best out of the machines. Adaptability is an essential part of Indian culture. Hence there should not be any cultural factors that could inhibit the growth of information technology

Companies have been reluctant to pursue the massive domestic market, choosing instead to pursue established international markets for information technology. Software developers often begin with domestic projects, but then attempt to graduate to contracts abroad. There had been hopes that opening up the export-oriented part of the industry to fourth generation programming languages would lead to a transfer of tools and their related skill to domestic market development, but this has not occurred to any significant degree. There remains a relatively poor awareness of new software tools and methods within the domestic Indian market. Another potential problem within the Indian software sector is the shift from an emphasis on programmers to a need for higher-level skilled personnel. There is a need for quality analysts able to understand and decide what a business is all about and how to best represent it in computing terms. Furthermore, it can be said that programming is incidental and routine and will soon be performed by computers using programming generators. Lastly, there seems to be an overemphasis on software product and an under-emphasis on the software development process, where primitive design and old production techniques are still being used (2).

Is India's software industry in danger of taking a steep decline in the near future? Probably not. The current growth patterns of the industry are truly remarkable, and the industry's strengths by far outweigh its weaknesses. As long as software companies manage their growth effectively and apply their resources to further develop and nurture the developing domestic market, they may be poised to claim first place in the global software industry.

BIBLIOGRAPHY

1. Big Emerging Markets 9/24/97
   http://www.stat-usa.gov/bems/bemsind/bemsind.html
2. "India: Charting a New Course" . India Today, May 1991
3. New Software Opportunities 9/27/97
   http://www.3seblr.soft.net/indiait.html #LINK19
4. "India's new screen heroes". The Independent, November 6, 1994
5. "Development: India to see boom in software exports", Inter Press Service, April 18, 1995
6. "Laying lines in India". Business Asia, July 17, 1995
7. "Telecom policy". Reuter News Service, May14, 1994
8. "Jobs for all in the global market?". People Management, January 26, 1995
9. "Indian software firms record 52% growth". The Reuter-Asia Pacific Business Report
10. "The last frontier". Business Week, September 18, 1995
11. "India And The Computer". C.R. Subramanian 1992.
12. "Indian Software industry launches crackdown on piracy". Agence France Presse, October 9, 1995
13. "Switch on to India". Banker, June,1995
14. "India: the new Asian tiger?". Business Horizons, May, 1995
15. "India Industry: Educated, cheap labor draws western software". Global Financial Markets, May1, 1995
16. "Internet connectivity for India". Newsbytes News Network, September 1, 1995
17. "Will India catch the tide?". Communications International, May, 1994