CHAPTER XIV

ADVANTAGE INDIA AND

PROPOSED GROWTH STRATEGY

Before concluding the study, it is imperative to arrive at an appropriate growth strategy for the software sector, in the light of the analysis and discussions so far. But prior to this, the India Advantage in software has to be put in proper perspective, by analysing the advantages and opportunities alongwith the limiting factors. In the light of this, the growth strategy has been arrived at in the present Chapter. The Chapter comprises the following parts: part 1 deals with the advantages of software over hardware, particularly in the context of India, the opportunities open to the country in software development, the existing and emerging limitations of the country in the software sector, and the conclusions emanating from the analysis. Part 2 highlights the major areas for strategic focus such as production and export, role of government and policy imperatives, manpower, R&D, supporting facilities and infrastructure, and other industry requirements like finance, marketing, and IT diffusion.

14.1 INDIA ADVANTAGE IN SOFTWARE

It is widely held that software development suits a country like India having a large pool of low-cost scientific manpower. So, it would be most appropriate to analyse India’s advantages in software, in the proper perspective.

14.1.1 Advantages of Software vs. Hardware

As regards software versus hardware, the basic requirements for producing software fall in line with the resource endowments of most developing countries, and India in particular. Whereas the design and process technologies for microprocessor manufacture are complex and costly and the required engineering manpower difficult to obtain, the software design process is essentially labour or manpower-intensive. While the software design is a stage in the software production process itself, the hardware chip design is only a prelude to the capital-intensive production of microprocessors.
Further, when the manufacturing requirements for hardware as against the available resource endowments pose entry barriers for developing countries like India, such entry barriers are limited or non-existent in software manufacture. The character of factor requirements for software production provide for considerable entrepreneurship potential. As against hardware, the per unit investment for creation of jobs in the sector is relatively small. The rate of obsolescence is lower in respect of software vis-à-vis hardware, making available a comparatively longer time span for software firms to recover their investment and realize economic returns. The sector can also offer high returns in a short pay back period.

14.1.2 India: Software Sector vs. Hardware Sector

In India, the software sector is far ahead of hardware in various dimensions like size, rate of growth, factor advantages, export, relative contributions towards the output of computer as well as electronics industry, and GDP. (ref. Table I of Appendix, Tables V.1, V.3A, V.3B, VIII.1, & IX.1). The size of hardware sector in India is too insignificant as compared to that of software. The growth rate is another pointer towards the greater strength and vibrancy of the software sector vis-à-vis the hardware sector. Whereas manpower which is the critical resource required for making software, is the potent advantage of India, for hardware like PCs, the critical components are motherboard, processor, and hard disc which are wholly imported. Even for the parts available indigenously, import content is too high with minimum value addition, and adverse implications for the country’s foreign exchange position. The hardware export is insignificant as compared to the software export. In fact, India’s potential as a hardware exporter is very limited (ref. Chapter IX). Hardware are net spenders or minimal earners of foreign exchange. Already there is de-emphasis of manufacturing activities and switchover to software activities or services by several leading hardware companies, attracted by the latter’s high margins and export potential. The remarkably greater contribution of software towards the country’s computer and electronics industry, total exports, and GDP, further reveals the relative significance of software vis-à-vis hardware in the Indian economy. Naturally, the software segment is taken as the engine of growth for the computer industry and also, to a considerable extent, the electronics industry. Even in terms of the various indicators of performance, the
software sector is ahead of hardware (ref. Chapter X). Thus, on the whole, the advantages and options for the country are loaded heavily in favour of software.

14.1.3 Manpower Advantages

Greatness of Indians:

The rating is that Indians are among the best of brains for software industry. For instance, in Silicon Valley, the rating for a high-tech company is the presence of an Indian chief technology officer often from the IITs or RECs. As per estimates, a fourth of the Valley’s net brainpower is Indians. Several top American IT giants have a strong preference for Indian software professionals. No wonder, about 50 percent of the annual H1-B visas granted by the US Government are reportedly garnered by Indians. Recently, in a rare honour, the Chinese province of Shandong named the CEO of TCS as its information consultant. It is this manpower potential coupled with cost advantages that is inspiring MNCs to set up their software production centres in India. (Krishnan, 2001; Economic Times, June 20, 2002; Verma & Others, 2000, p.38).

Knowledge of Mathematics and English:

India’s software manpower is really advantaged in the knowledge of mathematics and English that stands in good stead the software personnel. What constitutes the core skills of a software programmer is the knowledge of mathematics or, more precisely, the knowledge of algorithms and logic. And, English is the international language of computing. It is the language of the largest player in IT, viz., U.S.A. After U.S.A., India has the second largest English-literate population in the world. Command over this language certainly imparts an edge for India while competing in foreign markets, over countries like Taiwan, Japan, and Korea. Also, as compared to other countries, India will be having the maximum number of people in the most productive age bracket of 15 to 64, with the aforesaid advantages. These manpower advantages and favourable factors have given rise to the saying that times have changed and India should now treat its population not as a problem, but as an asset, the ‘population opportunities’. Already, the country is being viewed as the ‘Asian Tiger’. (Udell, J., 1993; Schware, R., 1987, p.1260; Businessworld, 2000, p.18; Vittal, N., 1998; Sudarshan, 2000).
Low labour cost and availability:

Software labour cost in India is quite low compared to that of many other countries. As per earlier estimates, salary costs in U.K. were 4 to 5 times and in U.S.A. 6 to 7 times higher than those in India. Even South East Asia was far ahead of India. Cheap labour cost is a great cost advantage in this manpower-intensive industry. Analysts have attributed India's recent IT export boom, inter alia, to this labour cost advantage. The World Employment Report, 1998-99, has also highlighted that skilled labour and low labour cost could provide India a considerable competitive advantage in software industry. Already the labour-intensive stages of software development, viz., coding and testing are got undertaken in India. The cost of experimentation of software product development which is highly failure-prone, must also be low in India, because of this cost advantage. Moreover, there is a good supply of software manpower from India's educational institutions and training institutes. (Hecks, R., 1992; Schware, R., 1989, ps. 60-61; Singhal & Rogers, 1989, ps. 203-4; Singh & Nandini, 1999; Joseph, K.J., 2001, p.17).

Proficiency and commitment:

In several areas Indian companies have advanced in proficiency like chip design, web-based services, and telecom software. Indians are also well-known for their commitment; the learning curve moves up very fast. They easily adapt themselves to new technologies, in an industry marked by fast technological obsolescence. Sources in the software giant, Infosys, have observed, "The Indian advantage is not so much about cost, but about the skill base and the knowledge we have in India and our ability to reduce time to market and deliver solutions quickly, effectively. The advantage is moving from cost to skill and time to market". (ESC, 2000a; Jalote, P., 2000; Verma & Others, 2000, ps 42-43).

14.1.4 Quality

Indian software units are also reputed for their quality achievements (ref. Chapter V). They were among the earliest adopters of the ISO model. Of the 31 companies worldwide that held the SEI-CMM highest ranking during 2000, all the 16 non-US companies were located in India. Outside the developed countries, there is no other country on par with India in respect of these software quality achievements. For
instance, China with about 1000 software companies in Beijing area alone, could not reach CMM level 4 or 5. (Kripalani & Clifford, 2000).

14.1.5 Opportunities for India

Systems integration / solution selling:

The manpower advantages are giving India good opportunities in systems integration/solution selling.

PC software:

As against mainframe software, PC software development is capital-light, and requisitions only software personnel. The market is highly lucrative and fast growing.

Outsourcing:

India has emerged as a major source for outsourcing in software and ITes, because of cost and manpower advantages. According to a World Bank survey, 82 percent of American companies had identified India as their top destination for software outsourcing. The time difference of about 12 hours between India and USA enables the US companies to virtually double the working time per day and reduce the development life cycle by half. Sub-contracting work may be expected from developing countries also.

Multimedia and web content development:

India is certainly positioned to emerge as a strong player in this sunrise area which is highly manpower-intensive. Content creation about India and all its regions, religions, history, classics, mythology, music, culture, etc., in all the 20 languages, is a massive opportunity. The Indian presence globally and the cultural and social similarity with several Asian countries, would greatly facilitate marketing. India may also obtain sub-contracting work for developing multimedia tools. Innumerable opportunities await skilled professionals when massive content is created for e-commerce, e-banking, e-finance, e-entertainment, e-education, e-publishing and such other portals that will get created. With broadcasting and webcasting increasingly getting integrated, global majors are busy scouting for partners to develop content.
Software maintenance:

Software maintenance which constitutes a major chunk of the outlay on software development, is another area where Indian firms could carve out a niche for themselves, thanks to the country’s manpower advantages.

Software testing:

The increased interest in software testing may work out to India’s advantage, since its cost advantage is making the nation the outsourced third party hub for software testing.

Trade in services:

The rising volume of trade in services in the wake of the IT revolution, is opening up a great opportunity for India. The Net-enabled export of labour-intensive services (like data-processing, typing and programming) to the developed countries, may be a boon for India’s labour, especially when international migration laws remain fairly stringent.

R&D:

In this borderless world, India has the potential to emerge as the global centre for R&D in software development and IT services, enabled by the emerging model of decentralised networked R&D.

Market size or scale economies in India:

Like U.S.A. who has become the largest economy in the world by applying on a continental scale the techniques of the industrial revolution, a country of India’s size can offer a huge market and scope for scale economies. (Bajaj, K.K., 2000, ps. 182-3; Dua, T.R., 1998; Polavarapu, 1988; Schweare, R., 1987; Capers, J., 1994; Bajpai & Radjou, 2000, p.453; Dataquest, Sept., 1988; BICP, 1989, p.66; Chakravarti, A.K., 1997; Economic Times, Sept. 13, & Oct. 24, 2002; Guha, B., 2000, p.2727).

14.1.6 Limitations/Constraints

Along with the advantages, it is also instructive to have an appreciation of the handicaps and constraints confronted by India in the software field.

Threat of competition:

India’s competitive advantages may experience erosion over a period of time. Non-English speaking countries like Russia and China with cheaper labour costs have
begun to learn English. Chinese manpower is estimated as 15% cheaper than that of India. Hence, the country should be anticipating tough competition in future times.

_Inadequate computer market and culture:_

The lack of an adequate computer market and culture is preventing the software industry from realizing its true potential.

_Erosion of labour cost advantage:_

As the growing scarcity of manpower is pushing up salaries in the software industry steadily, India’s cost advantage in software is taking a beating. The Table below reveals that the Indian salaries of comparable personnel ranged between 20-42% of US levels and between 38-53% of Irish levels for different personnel in 1995 itself.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Switzerland</th>
<th>USA</th>
<th>Canada</th>
<th>UK</th>
<th>Ireland</th>
<th>Greece</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems Analyst</td>
<td>74000</td>
<td>48000</td>
<td>32000</td>
<td>34000</td>
<td>36000</td>
<td>15000</td>
<td>14000</td>
</tr>
<tr>
<td>Systems Designer</td>
<td>67000</td>
<td>55000</td>
<td>36000</td>
<td>34000</td>
<td>31000</td>
<td>15000</td>
<td>11000</td>
</tr>
<tr>
<td>Development Programmer</td>
<td>56000</td>
<td>41000</td>
<td>29000</td>
<td>29000</td>
<td>21000</td>
<td>13000</td>
<td>8000</td>
</tr>
<tr>
<td>Support Programmer</td>
<td>56000</td>
<td>37000</td>
<td>26000</td>
<td>25000</td>
<td>21000</td>
<td>15000</td>
<td>8000</td>
</tr>
<tr>
<td>Data Analyst</td>
<td>67000</td>
<td>50000</td>
<td>32000</td>
<td>22000</td>
<td>29000</td>
<td>24000</td>
<td>17000</td>
</tr>
<tr>
<td>Test Engineer</td>
<td>59000</td>
<td>47000</td>
<td>25000</td>
<td>24000</td>
<td>na</td>
<td>13000</td>
<td>8000</td>
</tr>
</tbody>
</table>

Note: Figures are averages for 1995; na—not available.
Source: Kumar, N., 2000a, p. 32.

Studies have pointed out that after accounting for the other associated costs of Indian workers, their real cost is half of the US levels. Hence, competing on the basis of cost will not be a sustainable strategy in the long run. There will always be cheaper alternatives available to wean away the cost-conscious companies. The increasing automation is also reducing the labour intensity of software production, and the thrust is moving away from cost to quality of labour. In the long run, competitiveness of the industry will be more due to increasing employee productivity than low wage cost advantage. The software companies should move up the value chain and invest more in R&D. They should register increases in productivity faster than rises in wage cost, to sustain the country’s labour cost advantage. Currently, the productivity of Indian software engineers is below international standards. (Rani & Varma, 2001; Kumar, N., 2000, ps. 31-32; Schware, R., 1989, ps.60-61; EXIM Bank, 1992, p.26; Patibandla, Kapur, & Petersen, 2000, p.1268; Economic Times, Dec. 25, 2000; Debroy, B., 1994).

_Myth of labour cost advantage:_

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Though low labour costs offer certain initial benefits, over time other factors such as R&D, the level of computerisation in the country, availability of capital, and economical and efficient communications infrastructure will prove crucial in upgrading India’s status within the global software industry. The labour cost advantages should also be adjusted by considering differing productivity levels, to avoid incorrect assessments. Further, this advantage is restricted to custom software and services. In highly profitable areas like shrink-wrapped application packages or offshore large turnkey projects, several other factors are of equal or greater importance than cost, such as quality, reliability, performance, aesthetics, ergonomics, delivery on time, and other marketing considerations. In the largest software market, viz. USA, wages and salaries comprise only a limited portion of the cost structure of computer software companies. This greatly explains Indian companies’ dent only in the customer programming services. So, in order to turn this current cost advantage into a sustainable strength, they should improve productivity by using various tools like process optimisation, 4GLs, CASE tools, etc., and elevate competitiveness on quality, delivery and service.

It also has to be necessarily kept in view that labour costs are not the only element within overall charges, and overall charges are not at all as competitive as the salary rates. Office space in India is costly, with rates in some parts of Mumbai being as high or even higher than some Western cities. Telecommunications costs and interest rates are higher in India than their international averages. Travel and various other costs are incurred on most projects executed abroad. Studies have estimated that wages paid at Indian wage rates make up only 45 percent of offshore costs and 20 percent of onsite costs. Hence, the remark of Heeks, R., that while Indian software wages may be as little as one-seventh the size of those in USA, Indian software charges are only about half the size of those of USA. (Lakha, S., 1994, p.407; Correa, C.M., 1995, ps. 173-4; EXIM Bank, 1992, ps. 27-28; Heeks, R., 1992; Chopra, R.C., 1996).

Brain drain and scarcity of manpower:

Brain drain which is eroding India’s major advantage in software production, is the bane of the industry. Nearly 60 percent of IIT Mumbai and Chennai graduates in computer science leave the country for continuing studies or jobs overseas. Because of the acute global shortage of IT-trained manpower, a large number of IT-advanced
countries are turning their sights to India for manpower. With the result, there is an increasing competition for knowledge workers and consequential wage increases, telling adversely on India’s manpower advantage. (Hanna, N.K., 1994, p.98; Kumar, N., 2000, ps.31-32).

14.1.7 Conclusions

The following conclusions emerge from the above analysis: (1) As regards software versus hardware, the options are certainly in favour of software. (2) India has a definite edge over developed countries in software production mainly because of the manpower advantages, especially in respect of cost and quality. (3) India’s comparative cost advantage in software services is not as great as simple comparisons of pay levels in different countries would suggest because it is eroded by various other costs. (4) The country’s pricing edge is getting limited because of other increasing costs. (5) The advantages are mainly limited to some segments of the software industry, viz., services or custom software. (6) There is a veritable threat of these advantages getting eroded or losing punch in the long run. (7) The objective should be to consolidate current advantages in the short run and to enhance productivity or value addition in the long run. (8) It must also be endeavoured to switch over to products and packages as well as high value-added markets such as systems design/ integeation in the long run, supported by appropriate developments in skill and technologies, and re-shaping the manpower advantages accordingly. (9) India really stands advantaged in software, but this advantage has to be kept sustainable in the long run.

14.2 PROPOSED GROWTH STRATEGY

After having considered in detail the India Advantage in software, and in the light of the analysis and discussions so far, perspectives on the proposed growth strategy for the software industry are presented below.

14.2.1 Lay Thrust on Software

While strategising for the growth of computer industry in India, the thrust should be invariably in favour of the software segment. The advantages are weighing greater towards the software sector. This is particularly so because of the India Advantage in manpower.
14.2.2 Software Production

The domestic base of software industry should also be vigorously promoted, to facilitate the emergence of India as a global player in the industry. ‘Walking on two legs’ should be the strategy. The present predominance of low-value activities in software production must give way for high-value added activities, through a more skill-intensive and less labour-intensive approach. The options could be software modification, localisation, systems integration and related support services, the last one including maintenance and debugging operations. India should really take advantage of the enormous export potential in software maintenance, rightly termed as the maintenance opportunity.

Indian software companies must be encouraged to become System Integrators and solution providers wherever possible, on par with manufacturers, and provided all the incentives. Systems integration services are expected to be fast growing, mainly because of:

-- Growing requirement of multi-user, multi-tasking systems.
-- Availability of variety of technological options.
-- Trends towards increased customisation of products and services to users need.
-- Growth in vertical applications requiring large complex information systems.
-- Vendors assuming full financial responsibility and risk management for entire projects.

For all these, the increasing number of collaborations in software should be effectively utilized. (Das, D., 2000; Ganguly, P., 1990; Maxi/Micro, 1992, II, p. PC-3; Planning Commission, 1990-95, p.119; EXIM Bank, 1992, p.19; EIP, August, 1994. ps. 642-3).

Modifying / localising software:

Indian companies could acquire and adapt public domain software for secondary applications in business and industry. This could minimise their time and effort to develop and test software that is already in use. Also, modifying existing applications software in order to develop relatively new, commercially viable products to meet the needs of users more closely has a lot of opportunity in the horizontal markets. This has to be as a joint venture with the foreign companies so that the issue of IPRs is not involved. Localisation of software should also be promoted, so that the wider cross-
section of Indian population can use software-driven IT industry to their advantage. The government needs to encourage leading software companies like Microsoft, Lotus, Netscape, etc., for development of Indian language versions, in addition to indigenous efforts. (EXIM Bank, 1992, p. 38; Malhotra, S., 1999; Mehta, D., Jan., 2000, p.116; Vittal, N., 1998, p.28; Planning Commission, 1997-2002, p.73).

**Packaged versus custom software:**

The proportion of software packages should be enhanced both in domestic production and export. The sector should not be allowed to remain as a software services industry. In product development, the thrust should be on economies of scale, as credibility abroad is likely to be governed by enterprise-size. That is why even during the early nineties, an annual turnover of less than US$ 200,000 was not expected to be viable. Within packages, greater thrust must be on development of applications, which is India’s forte, and carries enormous potential. Systems software is investment-intensive and involves many man-years of labour. This is beyond the scope of many Indian software developers. Packages should be developed to address the needs of the industry as it works in the exported country, like USA. For example, a package written for the banking industry in India may not be suitable for sale overseas even to the same industry. Reliability, documentation, and user-friendliness of Indian software products should be brought on par with global standards. (BICP, 1989, p.63; Deepak Puri, 1987; Heeks, R., 1996, p.136).

**Focus: immediate and long term:**

During the immediate future, Indian companies should further consolidate their market share in the global customised software, but move away from onsite and low-end activities to offshore high-value components. They should focus more on offshore turnkey projects, and consultancy services rather than shrink-wrapped software packages. This is because, in the case of the former, it is easier for Indian companies to win contracts as they hold a better credibility before corporate users. Moreover, manpower costs weigh greater here than in packaged software where marketing costs dominate. However, for the long term, India has to create original technology or IPR, by way of software products and packages, to become an IT leader. As observed while analysing the India Advantage, when there is a veritable threat of the nation’s cost
advantages getting eroded, the emphasis should be to consolidate these advantages in the short run and enhance productivity or value addition in the long run.

14.2.3 Export

The thrust should be on net software export, by boosting the offshore component through policy and infrastructural support. The expanding avenues for software outsourcing have to be turned out as the nation's export opportunity. Productivity has to be substantially increased. This is essential not only to meet the export targets but also to prevent manpower 'cannibalism' from the export sector. The long run focus should be on the multiplier effect obtainable through product development rather than services. The software personnel, and hardware used should be kept up-to-date. The people need to be trained in new languages, new methodologies, and new hardware/software solutions.

Diversification of the destination for software export is imperative, instead of directing it in toto to English-speaking countries, especially USA. For this, Indian players will need to de-learn many of the current business practices and speedily adapt to the new cultures, languages and work practices in different countries. They should direct greater efforts towards the European Union as well as the Middle East, and Asia-Pacific. Another strategy could be to persuade developed nations which have a surplus balance of trade with India to award software projects to Indian companies as counter trade deals.

As regards hardware export, instead of exporting whole computer systems, the focus must be on manufacture of their sub-systems for export purposes, in accord with the global trend. However, devoid of a natural comparative advantage for hardware exports, efforts should be to export integrated systems, designing jobs, consultancy, and the like. As pointed out in the Chapter on Computer Hardware Industry, the focus should be on manufacturing products that have a high design component. Software skills should be leveraged to increase the hardware exports. The country cannot just import, re-assemble and export products and expect to be globally competitive. (Saldanha, L., 1983; Saran, S., 1996; Kumar, P., 2001).
14.2.4 Moving up in the Value Chain

As brought out under India Advantage, the software industry should move up the value chain, and base competition on ‘innovative capacity’, instead of ‘cost advantage’. The emphasis should switch over to higher value-added services, by acquiring domain expertise in the areas of operation. The thrust should be towards improving revenue productivity. This is essential to sustain profitable growth, when the shortage of IT personnel along with globalisation of their market is driving up salaries and driving down margins. In 1999, the revenue per employee in the Indian IT industry has been estimated to be of the order of only $16,000, as against $150,000 for Israel and $70,000 for Ireland. According to some sources, the productivity of software producers in India is only one-tenth of that in USA. This far outweighs the country’s advantage of cheaper manpower. However, moving up the value chain does not necessarily mean going in for products. It is equally important to move up the value chain in services. That is, develop expertise in all niche areas. (Heeks, R., 1992; Nilekani, N.M., 2000; Chakraborty & Jayachandran, 2001; Anandalingam, 1999).

**VLSI as a possible area:**

One possible area for software services companies, for climbing up the value chain, is chip design also known as very large system integration (VLSI) projects. Design is the key to this technology-driven industry. According to some estimates, the business potential for VLSI-related projects is more than US $1 billion. The Indian software companies are really advantaged, since VLSI projects require a combination of engineering and software skills. With the requisite encouragement, India can certainly emerge as an important location in the global hardware design industry, as increasingly design is getting separated from manufacturing both geographically and functionally. The emergence of ASIC as the norm in IT industry is adding further dimensions to the Indian opportunity. (ref. Chapter IX). However, lack of chip design training indigenously, the high cost of chip design tools and attrition of trained design engineers to USA are obstacles on the way which are to be overcome. There has to be expeditious manpower development in VLSI design, on the lines of software education. (Economic Times, May 23, 2000, & July 29, 2002).
14.2.5 ITes

According to a CII study, the global opportunity for ITes is expected to increase six-fold in the next 3-4 years. It would be the next growth driver for the industry. As the emerging trend of organisations around the world is to seek cost efficiencies by focusing on their core competencies and outsourcing other requirements, India must dedicatedly take advantage of its lower costs as well as the time difference of about 12 hours with U.S.A. The various constraints currently faced by the ITes units, are to be removed on priority. India should particularly utilize its potentials in the area of multimedia and web content development. The software success has to be replicated in the ITes sector as well.

Emphasis should be on exports of ITes which involve a high degree of human skill or higher-value added services. Along with cost advantage has to be established quality advantage as well, taking lessons from the premature demise of several MTS. Also, while delivering ITes to US customers, Indian companies must be well-conversant with their economic and cultural context. The rapid growth in ITes may lead to a deficit of qualified personnel and exert pressures on existing companies to retain human resources. The increase in compensation alone would not suffice to counter competition for talent and companies will have to create career paths and continuous learning opportunities for their employees. DIT must also evolve certification standards for various segments of ITes similar to its accreditation programmes for software training. E-commerce, still at the nascent stage, needs encouragement through incentives like tax exemption for some years. The industry association may be encouraged to undertake benchmarking of e-commerce adoption across industries.

In this context, the following suggestions of NASSCOM merit consideration:

-- Set up single window clearance by the Telecom Department for entrepreneurs applying for telecom facilities. DoT / VSNL / STP and others should be able to provide internet/intranet leased circuits within at least two weeks of application within a 50 km. radius of all the leading cities and towns in India.

-- Reduce by at least 50 percent the charges for international leased circuits.

-- Allow internet leased circuits to be connected to the company’s EPBX so that true teleworking is possible.
-- Modify labour laws to support 24 hours a day/7days a week cycles that are fundamental for this industry and enable women to work in all shifts as this industry is more suited for women operators.

-- There should be more toll-free lines for ITes companies to encourage their growth in the domestic area. (Economic Times, Sept. 29, 2000, Dec. 28, 2001, & Feb.6, 2002; Giri, A., 2000; Times of India, Aug.17, 2001; Sachitanand, 1999).

14.2.6 Aim for Selective Focus

The value chain in the IT sector is witnessing competition at every level. It is more important to be a leader in a few areas than to be a marginal player in everything, as evidenced by countries like Taiwan, Malaysia, and Korea. In hardware, the intent should be on competitive supply and specialisation, and nurture only the most promising segments. For indigenisation also, the approach should be selective guided by comparative advantages. The industry should be made export-oriented, to ensure volumes which decide viability and success in their production (ref. Chapter IX). As regards software which is already moving towards more of specialisation around certain industry segments, the approach should be to encourage selective focus, in the light of the industry’s specialisation, domain expertise and accessibility. (EIP, August, 1994).

14.2.7 Induce NRI-owned Companies

NRIs have been appreciably successful in IT industries in many countries. So far, India has only minimally tapped their immense potential. Some of the NRI-owned companies should be attracted back to India through appropriate mechanisms and incentives, and increase their share in FCs as well as FDI. This would enable a substantial increase in exports, as in South Korea and Taiwan. (Maxi / Micro, 1992).

14.2.8 Role of Government

Government policies were critical to the birth and growth of IT industry in several countries, as is the case with industries characterised by higher levels of technological and commercial risks. It is the Government which should neutralise these risks and impart right directions for the development of IT industry. For instance, the U.S. Department of Defence and Japan’s MITI were instrumental in developing IT in their countries, by acting as leading users of IT, supporting R&D, and regulating and providing incentives to the private sector. The concept of government-industry
consortia, initiated by MITI, Japan has now been replicated in electronics all over the world. The Government could initiate enabling policies for creating/enhancing competitive markets in IT products and services and investing in datacom. infrastructure, software manpower development, and IT user education.

In India, the government should increasingly encourage the use of IT and Internet within itself. E-Governance Report has to be an integral part of the Annual Report of every Ministry/Department. Particularly, the Government could promote IT applications in sectors where the market forces are still weak, or interest of the private sector is little, like environmental protection. All these could play a decisive role in enhancing the demand for domestic software. There should be preference for domestic packages over imports in the government purchases. Large projects undertaken by the state may also turn out as a source of trained manpower for the software industry. The growth of IT applications in prominent Asian countries like Japan, Taiwan, and Singapore reveals that this was promoted by them through planned policy measures. (Karki & Cameron, 1994, p.95; Schware, R., 1992, p.144; Dedrick & Kraemer, 1993; Munasinghe, M., 1995; Brunner, 1991; Hanna, N.K., 1994, p.82; Kumar, A., 1996; Chasia, H., 1998; Planning Commission, 2001, p.74).

**Government-industry synergy:**

There is also a need for further fostering the government-industry partnership. Now-a-days, government has to be a pioneer, a catalyst, and a promoter of Information Society. A few among the possible government incentives for promoting software development could be through tax exemptions/incentives, grants for activities such as product development, marketing, R&D, training as well as accelerated depreciation on equipment used, etc.

**Provision of information:**

The government may publish data periodically on existing production as well as market requirements in respect of various items of IT, over the next 5-10 years. This would enable entrepreneurs to focus on the promising areas. For this, there should be an effective support organisation whose role is to identify and monitor emerging key technologies, like the Institute for Information Industry of Taiwan. Even some of the newly set up IIITs or the NIC itself could fit in with this requirement. A similar institute
is required in respect of ITes also. It is also important to have the right kind of information on imports, exports, sources for inputs, certification agencies and government policies, etc., through a single source. (Hanna, N.K., 1991, p.77, & 1994, ps. 63-64; Agarwal, S.M., 1985; Planning Commission, 1997-2002, p.121).

14.2.9 Policy Imperatives

As the industry sources have argued, to increase PC penetration and keep this obsolescence-prone market growing, it is advisable to allow 100 percent depreciation on PCs. This would create a strong second-hand market with price points of around Rs. 15000, through faster replacement cycle. The step would be revenue-neutral, as it would bring a large percentage of the grey market in the excise net, boost revenues and compensate for the national corporate tax loss. With the increased PC penetration, there would be corresponding increase in the demand for software also.

Uncertainty in policy and fiscal matters which discourages investment, has to be minimised. As frequent changes in rules and policies make long-term planning difficult, the aim should be for continuity of economic policy. Controls should be fiscal and procedural, and not physical. The regulatory procedures should be minimal and substantially simplified. Moreover, if Indian companies have to compete globally, a competitive climate for investment and production as prevailing in the competing countries should be put in place. Also, IT policy must be conceived as integral to the overall economic strategy in which sound economic policies will benefit the IT sector and the diffusion of IT will have positive effects on economic development and social welfare. Further, whereas globally IT has grown the ‘hardware first’ route, India can and should look at the ‘software first’ route. This is since the nation’s assets are not capital, technology and marketing power, but people, skills and entrepreneurial spirit.

Informatics policy of India like in most developing countries, has, by and large, remained as supply-oriented and not user-oriented. Adequate priority should also be laid on the diffusion of informatics, especially keeping in view the huge domestic market. IT policies in other developing countries, who also share India’s aspiration for global IT leadership, are based on the dual strategy of supporting indigenous demand and export endeavours. China, for instance, has conscientiously developed its domestic IT market, which is now the fastest growing IT market in Asia, and the second largest in the Asia-
Pacific region (excluding Japan). By leveraging economies of scale offered by the large Chinese market, several domestic Chinese software vendors have since emerged as leaders in various niche areas, as instance by ‘Kingsoft’ and ‘Kehhua’ software.

As regards technology policies, in a fast-moving sector like computer industry, there has to be provision for dynamic changes in policy based on changing technology and markets; timeliness is critical. Presently, cumbersome procedures result in a product becoming obsolete before it is launched. It would not suffice to be innovative and aggressive. The movement has to be really fast, to pre-empt competition. In today’s world, windows open but they also close suddenly. So the work has to be got done before that happens.

Acquisitions and alliances which are now integral to the growth strategy, are to be encouraged. Through globalised operations, the Indian software companies may be enabled to elevate their international competitiveness and efforts at value-addition. Strategic alliances with established players may impart Indian firms some of the competencies required for offering higher value-added services. The strategy enables companies to quickly penetrate international markets leveraging the marketing resources, instead of a longer and usually less successful independent foray. The local business partner obtained through M&A would be in a better position to tackle indigenous issues like dealing with official regulations and accessing local infrastructure as well as raw materials. It also allows the companies to employ locals overseas – people who have greater knowledge of the market and customer requirements. Another plank of the same strategy should be to acquire start-ups abroad, so as to access new customers and markets. (Planning Commission, 2001, p.37; Seshagiri, N., 2000, ps. 9-10; Malhotra, S., 1999; Bajpai & Radjou, 2000, ps. 455-6; Vittal, N., 1998, ps. 22-24; Singhal, M., 2000; Nilekani, N.M., 2000; Mitra, S., 2000).

14.2.10 Manpower

As regards manpower, strategic recommendations in detail have been brought out in the Chapter on Manpower, and hence not repeated here. In brief, the emphasis should be to enhance the availability as well as productivity of knowledge-workers. Educational institutions should re-orient their programmes to the emerging needs of software industry. There should be emphasis on new and inter-disciplinary programmes,
and areas like information analysis, software project management, estimating and measuring productivity and software marketing. Dynamic and sustained industry-academia interactions are required, to promote IT manpower development. These two classes of interests should together assess the future skill/manpower requirements which should lead to the design of educational and training programmes as per the industry requirements. More centres may be opened to teach foreign languages like Japanese, German, French, and Korean so as to give impetus for software export to these countries.

14.2.11 Industry-Academic Interactions

Developing latest proprietary software technologies have to be prioritised. For this, the present gap between the software industry and academe should give way to an active association between the two, as in U.S.A.. The following measures suggested by NFIEN, are worth pursuing: industry must constitute chairs in the institutes; there should be regular exchange between academicians and executives; industry must come forward to support the engineering profession, particularly in R&D and infrastructural facilities, and adopt at least one lab in an engineering college; engineering colleges must be attached to some industry or the other like medical colleges with hospitals; industry must give projects to students on commercial basis; and there should be regular seminars held jointly by industry and institutes on subjects of common interest. (EFY, 1998, ps. 61-62).

14.2.12 R&D

R&D is an imperative for software success. Advanced/futuristic areas of research should be pursued through large government funding and time-bound programmes. The focus should be on application-oriented and result-oriented R&D. It may also be ensured that right-to-do business operations in India is coupled with investment in R&D which leads to development and transfer of technology, as in countries like Mexico and Australia. A few other initiatives could be:

-- Encourage MNCs to set up R&D centres.
-- Increase investments in R&D in educational institutions.
-- Explore ways to encourage every firm to spend a minimum percentage of sales on R&D, and technology importers to spend several times of that import cost on R&D.
--Promote joint sponsored research by government, industry and academic institutions, as in U.S.A.

--VC and sweat equity should be brought in specifically for R&D.

--Set up resource centres in the country to concentrate on selected areas of research.

Japan is an example to be emulated, where 20 percent of R&D programmes are supported by government and balance 80 percent by industry, particularly since the Indian companies are small in size and are not in a position to set up their own R&D infrastructure. Creation of common infrastructure would bring R&D within their affordable limits. In fact, most R&D projects do not succeed for want of financial resources. So, the Government should play an important role in inducing enterprises to undertake R&D. Supporting technology incubation in leading technical institutions, could be appropriate, in the form of a national incubation network for encouraging technology start-ups. In fact, many countries are providing this incubation support. A few Science Technology Parks must also be set up proximate to academic institutions as a collaborative effort of DIT-academia-entrepreneurs-banks, a la trends around the world. NRIs may also be encouraged to participate.

Do not reinvent the wheel. Instead, a nominated institution may keep an inventory of all relevant research happenings. There should be effective utilization of international R&D cooperation, especially in the areas of long term and medium term research, after weighing the potential of concerned cooperating countries, institutions, research laboratories or industries. In addition, in the internationalisation of R&D, focus must be laid on the emerging model of decentralised networked R&D. In the present world without borders, India has the potential to emerge as the global centre for R&D in software development and IT services. However, to maintain India's competitive edge in this regard, national strength in the emerging area of technologies and applications would need to be strengthened further. (Planning Commission, 2001, ps. 152-3, 156; Kumar & Siddharthan, 1997; DoE, 1998, ps. 37-38; Chandra, N.K., 1994; EFY.,1998, ps.55-56, 62; Chakravarti, A.K., 1995, ps.230-3).
IPRs and Patents:

Another related strategy should be to modify India’s patent laws to make it in tune with the corresponding law in developed countries. Till this is done, it should at least be attempted to curtail the time taken for awarding patents from 6 years to less than a year. A clear-cut policy should be in position to provide protection to IPRs, with DIT taking the lead role for all R&D activities including international patenting. The Department should have a dedicated patent database. Also, the country must have a VC fund of, say, Rs. 100 crores, to enable any promising technology by an Indian inventor to take patents in U.S.A. and a dozen developed countries. With this, Indian scientists and technocrats will be encouraged, and there will be full IPR protection. (Vittal, N., 1998, ps. 33, 35; Chakravarti, A.K., 1995, p.231).

14.2.13 Infrastructure

A fast and efficient telecommunication structure is highly essential for the industry. There should be a National Internet backbone comprised of nationwide optic fibre network. It should be an information highway with a wide bandwidth to facilitate all sorts of communication: voice, data, multimedia, etc. The Government should encourage setting up of domestic Internet exchanges, so that the local e-mails are not routed through the U.S.A. and the requirement of international bandwidth would come down. Increase in availability and decrease in tariffs is the need of the hour, for telecom. As lower tariffs can stimulate datacom demand, these should be determined on a cost plus basis. Common facilities and infrastructure must also be created like Techno-Parks which can greatly boost up software development.

A few other measures for infrastructural improvements could be as follows:

-- Set up adequate ground stations (as in STPs) to disperse the software industry throughout India.

-- As most start-up and small companies cannot afford leased satellite circuits, make available packet switched networks\(^{62}\) in all the major cities. Their availability is now limited to a few cities like Mumbai, Delhi, Chennai, Hyderabad, and Bangalore.

14.2.14 Internet

In this age of Internet, the country should have an effective strategy in position to propel its growth and expansion. This would accelerate the progress of computer industry in general and software in particular. An appropriate option could be sharing of revenues between the telecom authorities and ISPs and providing free ISPs, in accordance with the global trend. It is high time for the telecom sector to appreciate that their services are price-elastic. As regards access, in the absence of adequate telephone network, it would be advisable to depend on public access to the Internet through community access centres. This can also go a long way in correcting the digital divide between the information have-nots and have-nots. The 6,00,000 odd public telephones in the country, 75 percent of which are in the rural areas, may be upgraded into Internet kiosks. A development in parallel could be the improvement of PC density. Cheaper and more user-friendly devices than the PC may also be popularised, so that the Internet may emerge as a truly mass medium. Regarding infrastructure, the government can use its procurement power and funding of public projects to develop the national Internet backbone. Utilities like the Railways, State Electricity Boards, National Power Grid Corporation, Gas Authority of India Ltd., etc. should also be allowed to build telecommunication infrastructure as envisaged by the Jalan Committee and as prevalent in several countries like USA, Japan, EEC nations, and China. Another alternative to unlock the Internet in India could be the cable network with its reach across the country. The penetration of TVs with 55 million numbers could provide the base for an Internet connectivity of as high as 25 crore connections. (Kumar, A., 1996; Telematics India, 1998; Kurup, E. J., 1999; Sikdar, T., 2000; Karnik, K., 2000; Economic Times, July 29, 2001; Parthasarathy, A., 1999; Kar, P., 2000).

14.2.15 Technology Parks/ Group Activities

Certain specifics of STPs need improvements. There should be increased private sector participation in their management, to make them more responsive. The financing for STP units should be further improved and liberalised. Overseas telecommunications and hardware facilities of the parks could also be made open to software firms located outside the parks, through electronics means, at appropriate fees. Similarly, the park may be used as a nodal point for the delivery of a variety of national and regional
services such as information, marketing, training, and other support services. Another course of action should be to harmonise and co-ordinate the various Government schemes currently under different Departments and following different procedures, viz., EPZs, 100 percent EOU Rs, EHTPs, and STPs. The smaller software entrepreneurs may be encouraged to set up self-help groups, like SEWA in Ahmedabad. This could help the group members in keeping themselves updated with technical information through organising seminars and training programmes and taking up common problems with concerned authorities. Indigenous companies could also ‘cluster’ together for common objectives and thus share out resources and costs in several key areas, particularly in view of their geographic concentration. (Hanna, N.K., 1991, ps. 79-81; Kumar, N., 2000, p.37).

14.2.16 Finance

Easy and low-cost capital is the lifeblood of IT industry. As the traditional methods of loan finance would not suit the software industry where the resources are time, manpower, and brains, the norms will have to undergo appropriate adjustments. Some of the possible financial initiatives could be:

--Lower debt-equity ratios, say 5:1, alongwith large variety of debt instruments.

--Margin money requirements of only 10 percent, so that software companies will not be constrained to concentrate on on-site services, owing to inadequate working capital.

--Endow indigenous firms with adequate financial support to acquire software tools and equipment, and undertake finance-intensive marketing.

--Provide incentives and facilities for national banks to orient their officials in financing the software industry.

--A la Japan, accept intangible assets like intellectual property as collateral against loan and not insist on fixed assets.


14.2.17 Marketing

Marketing involving heavy advertising is critical for software success, especially for packages in the American market. Considering India’s poor image as a producer of
software products, it would be commercially wiser to acquire US companies as a front-end set-up to market the products or to go for a marketing tie-up with an US company. Asian NIEs like Korea, Taiwan, and Singapore have tried out these strategies successfully. In the present size and structure of the industry, setting up an overseas marketing and support office is beyond the scope of majority of would-be exporters. In the absence of specialised marketing institutions and software publishers, firms should attempt help from support institutions that would carry out regular and systematic market surveys, workshops, and promotion – and recruit foreign partners with strength in marketing. Indian companies should tie up with US companies such as Valueplus, California, who help overseas firms identify market opportunities and sell software in U.S.A. without charging for the market information and have only a joint profit sharing arrangement when software packages are sold. They should also make use of the multiple channels of distribution in USA such as publications, viz., various software directories, online software databases, industry associations, and frequent industry trade shows. Trade associations like NASSCOM should also endeavour to fill the gaps in market intelligence. As suggested by Polavarapu, software houses may attempt tie-up with hardware vendors to push the products on an OEM basis or as value-based resellers, to boost up their sales volume. Selling directly to the customer is almost impossible, initially.

Excellent manuals/documentation and good system software support are highly essential for effective marketing of software. Sufficient foreign exchange must also be made available to meet the associated costs of undertaking software export. There should be marketing assistance, since selling packages is possibly 20 percent development and 80 percent marketing. The Government should set up a Market Development Fund instead of setting up any government agency for marketing software and services overseas. But, essentially, marketing has to be through foreign companies themselves, since appointing distributors abroad may not be advisable. Indian companies may also take over companies abroad which have well-known packages but have not done well due to ineffective management and inadequate resources. Acquiring of software publishing firms abroad could be another powerful tool. (Tandon, 1990;

14.2.18 Building Brand Equity

Building brand equity is extremely important. The country should bring in its best to better the customer perception overseas towards Indian companies. Initiatives are really wanted to improve the project management skills of Indian software entities. India’s technological lead over other developing countries has to be translated into a better image through sending delegations abroad, seminars, etc. on a regular basis. Credibility really matters for success in software export. The software supply should be up to the customer’s expectations, in terms of timeliness, quality, and satisfaction.

14.2.19 Making Available the Latest Hardware, Technology Tools

Whereas a major portion of Indian software exports is in the mainframe segment, much of its latest hardware is not available in India, primarily because of the exorbitant cost and high rate of obsolescence involved. For this, corrective measures on the following lines could be initiated:

-- The Government may instal a battery of latest mainframes, superminis, and workstations in major cities and link them on a network. Software exporters should be allowed to time-share these machines, as in STPs.

-- Hardware imported by the FTZ units or EOUs should be allowed for domestic software production, provided export commitments have been met. Exporters are often hesitant to import costly hardware purely for the export market. Latest technology tools like CASE tools, application generators, etc. should also be adopted to streamline software production and to enhance competitiveness. Availability of the latest hardware platforms and software development tools at internationally competitive costs, could allow software developers to compete internationally and to promote diffusion. (EXIM Bank, 1992, ps.34, 38; Sharma, K.D., 1996).

14.2.20 Piracy

The solution to this as most developers put it, is nothing but threats and awareness. Government must advertise to create awareness, like it does in the case of income tax evaders. The users are to be educated that software has value and it is a product of hardwork. Hardware vendors should not supply software free with their
products. As proposed by MAIT, a small logo must be developed indicating that software piracy is a crime, which will be included in all advertisements by hardware manufacturers. In fact, India’s Copyright Act of 1984 is sufficient to protect intellectual property, provided it is effectively enforced. (Kohli, F.C., 1994; Parpia, M., 1990, p.140).

14.2.21 Increase the Use of PCs

It is understood that, at present, 70 percent of PCs worldwide are used in network. So, it is almost incumbent on India to improve the network infrastructure and create diverse databases to allow increased use of PCs. The target should be universal access to internet, extranets, and intranets. Improved maintenance services for PCs would also go a long way to increase their reach. All these, in turn, can generate increased demand for software. Low-cost PCs with Indian language support, should be made available, through collaborative ventures among academia, industry and Government. As already mentioned, market for second hand PCs has to be encouraged by making these available in good numbers and of contemporary vintage. (Arora & Dadheech, 1996, ps.504, 510; Mehta, D., 1999, & Jan., 2000; Planning Commission. 2001, ps.37, 88).

14.2.22 IT Spending, Awareness/ Computer Culture

IT spending (on hardware and software) in India is estimated at 1.68 percent as a proportion of GDP. This needs to be increased to 2 to 3 percent. As per Government directive, around 3 percent of every Department’s expenditure has to be earmarked for IT usage. This should be effectively monitored and ensured, and eventually pushed up to 5 percent, particularly when the Government is one of the major investors in IT. Also, the direction of spending should not be predominantly hardware, but also software and maintenance. There should be facility for imparting computer skills in the entire educational set-up. Simultaneously, a mass campaign has to be initiated for creating IT awareness in the country. Computer literacy should look up. After all, without a huge domestic computer user base, there cannot be a sizable competitive environment for Indian software. Of course, installed base alone would not suffice to galvanise the software industry. This should be followed by a cultural transformation in the attitude towards computerisation and the role that computer software plays in the success of a business.

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