Growth Prospects for the Software Industry in Sri Lanka and an Appropriate Policy Framework

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Abstract

Software development and IT education & training are two segments of information technology, which have a tremendous potential for Sri Lanka ubiquity and access speed of Internet has opened new dimensions for development of the software industry. At present the concept of providing software as a service has created lot of interests among software companies. Due to the availability of trained manpower, India has been able to take the best advantage of the shift of the software industry from the USA towards Asia during the last decade. Web based interactive solutions, which include many spheres like e-business, e-learning and e-governance and IT enabled services are expected to be the major drivers during the coming decade. Though Sri Lanka has so far failed to develop the enabling factors of software industry to the optimum levels, it has the potential to do so. An appropriate policy frame work to develop the software industry has to cater to the key enabling factors such as; commitment of the government, trained manpower, info infrastructure, low cost funding, incentives and simplified investment approvals, promotion of investors and exports, local demand and legal protection for intellectual property rights.

Introduction

Segmentation and Characteristics

Software is one of the three main segments of the Information technology (IT) industry. The other two are hardware and education & training (Infoline, 2000). Software industry can be further segmented to services and products. Services comprise of activities such as programme development, information processing, provision of programmers (known as body shopping), provision of consultancy services, IT enabled services and data entry. Products comprise of system software or application software. Application software can be custom made or made for the mass market.

The operational model for the above two segments of the software industry differs vastly. Services are paid on a contracted rate based on time or a specified work content. The initial capital investments are very low and the main expenses are incurred on the manpower in case of the service model. Operational model for products needs varying levels of research and development investments depending on the product. In both service and product segments each company normally focus on a specific functional area such as banking, health, electronic commerce and electronic learning. Very often companies start with providing a software service at a lower end, gradually go up the value chain to provide services at the higher end, and then shift to develop products.

Emergence

Since the explosion of semiconductor based industry in 1950s at Silicon Valley, 1960s and 1970s were confined to the production of mainframe and

minicomputers. IBM dominated the computer market using two main strategies: offering a total system comprising hardware, software & training and restricting the compatibility of software to their own machines (Egan, 1998). During this period computers were mainly used by large businesses as bookkeeping tools (Howell, 1995). End users of large companies, which were using computers, were heavily dependent on in house EDP departments for their information processing requirements. By 1970 IBM had close to 70% share of the market for hardware, software and services (Egan, 1998). At the time computer vendors were making system and application software, as distinct and complicated as possible, to inhibit their clients from switching to competitors (Egan, 1998). In 1970s this trend was overturned by two developments: the anti-thrust action against IBM, both of which forced them to "un-bundle" hardware & software; the improvements in processor technology, which lead to manufacture of cheaper mini-computers (Rounds, 1989: 37-40). Cheaper computers increased the demand, which in turn opened up opportunities for independent software developers. As a result, hardware vendors found it increasingly difficult to continue their domination of the software sector. Also, with the introduction of the personal computer (PC) in 1981 by IBM and subsequent developments by Apple Computers, which made PCs easy to use, the information processing at large companies began to de-couple from central EDP departments. Also the smaller businesses could not afford to have separate EDP departments. In the contrary, independent software companies were able to spread development costs across many users and were able to consolidate themselves. In the 1980s the development of user-friendly software targeted at end users, particularly the invention of the spreadsheets made the computer a lot more useful business tool. With the advent of networks in 1980s, PC based local area networks (LAN) became as powerful as mainframes and also opened further areas for software technology to venture in to. Aforesaid factors helped the emergence of an extremely strong software industry in the1980s.

Role of Software

Gordon Moore of Intel Incorporation projected in 1960s, that the density of circuits possible to engrave on a semiconductor chip will double every 18 months (which is also known as Moore's law), has held true over the last 30 years. Developments of microprocessor technology have led to reduction of the cost of processing information to almost unbelievable proportions (Egan, 1998). Improved processing power kept on inducing the demand for new software. During 1990s, developments such as opening up of Internet to the business world, rapid advancements of telecommunication technology and enhancements of multimedia technology made usage of computers extremely popular in both domestic and business spheres. In the USA, 90 million households had access to Internet by the year 2000 (SIIA, 2000-c). Internet has empowered consumers with unprecedented choice and convenience (SIIA, 2000-c). During the past decade almost all-functional areas ranging from accounting and inventory management to personnel and production schedules of most businesses in the USA have embraced IT (SIIA, 2000-c), leading to vast improvements of productivity. As a result, the productivity growth in the USA doubled from 1.4% between 1973 and 1995 to 2.8% from 1995 to 1999 (SIIA, 2000-c). The savings realised as a result of IT investments were enormous, e.g. IBM saved US$ 200 million in 1999 by using the web to deliver instructions to its employees and Cisco has saved a total US$ 400 million by providing customer support via the Internet (SIIA, 2000-c). IT has begun to revolutionise the process of education. New e-learning concepts have enabled one to learn at one's own place and own pace (Infoline, 2000), and have

also dramatically increased the accessibility of a wide variety of educational material on the Internet for learners of all ages (SIIA, 2000-a). Worldwide, there are a whole host of other areas both for household and business use that are emerging to further increase the scope of usage of computers. However, what is unique is that all the above can only be realised by using appropriate software. Therefore, efficient and user-friendly software is becoming the most decisive and valuable link in IT.

Shift of Software Industry towards Low Wage Countries

In the 1980s software industry in the USA was booming and its universities were geared to produce the personnel with required skills. However as the demand grew, the USA could not cope with the growth, and had to look for personnel from low wage countries. Asia, which traditionally has had personnel with good numerical and logical skills (which are prerequisites for a successful career in software development), was therefore an obvious source for manpower. India was quick to take advantage of the dawned opportunities and body shopping and onsite contracting became lucrative businesses since late 1980s. Visa restrictions and the need to pay the programmers global rates (when working within the USA), increasingly threatened both these segments. Hence, software companies, which were mainly located in the USA, started moving to low wage countries in Asia and elsewhere. Same trend prevailed for outsourcing of software development. As shown in section 5, India has succeeded in attracting most of these companies because of the excess of such personnel in the country in the early nineties.

Table 1 - Countries of Origin of Foreign Collaborators of Software Development Companies Signed Up To Commence Operations in Sri Lanka

Country	Number
None	20
USA	14
UK	10
India	4
Germany	4
Australia	4
Belgium	3
Sweden	3
New Zealand	2
Hong Kong	2
Japan	2
Australia	2
Norway	1
Netherlands	1
Luxembourg	1
Russia	1
Israel	1
Total	**74**

Source: Board of Investment, Sri Lanka 2000

However, most other developed countries too underwent the same sort of development cycle as the USA and started to locate software industries in Asia. Table 1 shows the countries of origin of the foreign collaborators of the enterprises that have been approved by the Board of Investment (BOI) Sri Lanka. The range of countries amply proves the interest shown by developed countries worldwide to locate their software development facilities in a low wage country in Asia, namely Sri Lanka. It should be noted that this level of interest was evident, in spite of the severe shortage of manpower required for software development in Sri Lanka (Munasinghe et al., 2001). In 1999, 203 of the fortune 500 companies outsourced their software requirements to India (Metha, 2000). Thus there is a strong desire for the developed countries to locate software industries in low wage countries or to outsource their software needs from them.

Overall market trends

Volume

According to most industry analysts, the overall global IT market in 1997 was around US$ 705 billion. The share of software segment, which stood at 48% of the total IT market in 1997, is expected to rise to 52% by the year 2000. Seventy five to eighty percent of the IT manpower requirements are estimated to be made up of those engaged in software industry. The global software market stood at US$375 billion in 1997 and is expected to grow to US$560 billion by the year 2000 (Infoline, 2000). The world market for packaged software is expected to reach US$153 billion by the year 2000 (ITDS, 2000). The global software market is estimated to rise to US$ 2 trillion by 2008 (Nasscom, 1999). The five top markets United States, Japan, France, Germany and United Kingdom accounts for more than 80% of the global software market. The total number of software professionals employed in the US in 1996 was 2.065 million, this is estimated to rise to 3.345 million by the year 2005 (Infoline, 2000).

Potential Product Areas

The concept of software as a service is becoming validated due to the widespread availability of the Internet, increasing high-speed access and potential for further growth (SIIA, 2000-b). Based on this concept, service or application is provided from a centralised data centre across a network, Internet or Intranet. Users can access the applications on a recurring fee basis. This concept enables service providers to add new features, upgrade products and fix bugs on a real time basis. Users can reduce their hardware requirement and up front fixed costs on software drastically, thus making applications like Enterprise Resource Planning (ERP) affordable to even small firms. This concept also ideally suits the wireless devices, which is expected to be the main venue for Internet access by the middle of 2001. Throughout the industry the concept of software as a service has gained tremendous momentum, so much so that Microsoft has even "bet the company" on its growth (SIIA, 2000b). According to analysts, software applications will begin a mass migration from the desktop to network servers and online application service providers (ASP).

Opportunities resulting from e-business software solutions would be the other major driver of growth of software industry. It is predicted that India has the potential to earn US$ 10 billion from e-business solutions by 2008 (Nasscom, 2000-a). In addition there will be a growing demand for other web based

interactive services. There is a tendency for Internet-based software to centre around the Java computer language, which allows software to run on any platform regardless of the operating system (ITDS, 2000). There is also a trend to develop software around the freely available network operating system Linux.

Many analysts predict IT Enabled Services or "Remote Processing" to be a major driver in the IT led services industry. India anticipate to earn US$ 17 billion per annum by 2008 from remote processing (Nasscom, 2000-a). IT enabled services cover; data processing, call centres, medical transcription, data digitization, back office operations, web content development, animation and many other services. Manpower required for these services can be trained within a short time and effort, making it ideal for Sri Lankan entrepreneurs to venture in to software industry.

Potential Geographical Areas

The USA had the largest global market followed by Europe, which was dominated by UK, France and Italy (Currie, 2000). Japan, Canada and Germany are some of the other major markets. Destinations of software exports from India during 1999-2000 were; 62% to North America (USA and Canada); 23.5% to Europe; 3.5% to South East Asia; 3.5% to Japan; 1.5 to West Asia; 1.5% to Australia and New Zealand and 4.5% to rest of the World (Nasscom, 2000-b). These geographical trends are expected to prevail in the next 5-10 year period.

India's Dominant Market Share

To date, India has made the best use of the prevailing market opportunities. During 1999-2000, India's software exports amounted to US$4 billion, a growth of 57% compared to 1998-1999. Indian software exports accounted for 10.5% of its total exports in 1999-2000, compared to 2.5% five years back. During 1999-2000, 37 Indian companies have exported more than US$25 million worth of software and services while 60, 180 and 500 companies have exported US$12.5, US$2.5 and US$0.25 million worth of software respectively. During 1999-2000 a total number of 1250 companies were engaged in export of software from India. (Nasscom, 2000-a). During 1999, 203 of the Fortune 500 companies outsourced their software requirements to India, and 12 out of 19 companies in the world, which acquired Software Engineering Institute (SEI) level 5 maturity (SEI level 5 is an industry bench mark signifying the achievement in growth and size) were located in India (Mehta, 2000). Between 1990 and 1999, the Indian IT software and services sector has achieved annual growth rate of more than 50% and expanded almost twice as fast as the US software sector for the corresponding period (Mehta, 2000).

According to industry analysts, the prospects for further growth of Indian software industry are very bright. According to McKinsey (1999), in the software and IT services sector, India has prospects to: (a) achieve annual revenues of US$87 billion, (b) increase exports amounting to contributions up to 35% of India's total exports, (c) to provide employment to 2.2 million people and (d) for the total market capitalisation to reach US$225 billion, by the year 2008. Software exports from India is estimated to account for almost 19% of India's total exports and would emerge as the largest exporting sector of the country by the year 2003 (Mehta, 2000).

With the objective of making India a super power in IT, in May 1998 the Prime Minister of India formed a national taskforce in IT and software development to formulate a long term national IT policy. The taskforce has prepared three key reports: IT action plan – I (software), IT action plan – II (hardware), IT action plan – III (long term national IT policy), (Nasscom, 2000-b). The taskforce has looked in to every aspect of the IT sector and recommended over 300 specific measures to the Government of India who is aspiring to fulfil the following objectives by the year 2008: (a) developing adequate info infrastructure, (b) achieving the targeted annual software exports amounting to US$50 billion, (c) accelerating PC penetration in the country from the 1998 level of one per 500 to one per 50 people along with universal access to internet (Indian Govt, 1999-a; Indian Govt, 1999-b; Indian Govt, 1999-c). India thus seems to be way ahead in many aspects related to planning and setting objectives compared to other countries in the region.

Factors for India's Success.

As demonstrated above, India has made a tremendous inroad in capturing a significant share of the global IT market. No one would have dreamt of reaching this state within a short period of time. No other developing country has been able to even come close to matching India's achievement. It is useful to analyze the reasons behind this achievement. These contributory factors can be classified under the following headings: I) Human resources, ii) Infrastructure support, iii) Appropriate Policy support and iv) Other.

Human Resources

Skill Availability

Availability of skilled manpower in abundance is a key factor (Jaber, 1999). India's manpower employed in the software sector as on March 31 1999 was 250,000 (Nasscom, 1999). As of 1998 India had the capacity to train over 60,000 IT personnel annually (RINSCA, 1998).

Low Cost

The cost of Indian programmers is said to be 15-20% of their counterparts in developed countries. Indian personnel costs are low even compared to competing countries in the region. At early stages of entering the software market this gave Indian software industries a cutting edge in their pricing for their software products (Infoline, 2000). However with gradual increase in remuneration for Indian software developers this position is changing.

Language Skills

India has the second largest scientific labour pool with a working knowledge in English (Jaber, 1999; Mehta, 1998). This gives India a competitive advantage over their other low cost counterparts in countries such as Russia and China (Rubin, 1998).

Skill Spectrum

The manpower pool in India is made up of a wide spectrum of skills, thus enabling it to offer software services ranging from clerical support, data processing to development of advanced software systems (Infoline, 2000).

Skill versatility

Indian manpower has experience in a variety of platforms. Large number of software companies have gathered expertise on many platforms such as AS/400, IBM mainframe, DG, Unisys, HP, DEC, UNIX, Tandem, PC, OS/2, Novell, etc. (Infoline, 2000).

Infrastructure Support

Information Infrastructure

As of year 2000 India had over 500 high-speed data communication links of 32 to 256 kbps, connecting the software companies with their clients abroad (Infoline, 2000).

Software Technology Parks (STP)

Availability of STPs with infrastructure facilities such as high speed international communication links, internet, teleconferencing, fax, stand by power generators and recreation facilities, in most of the states (Choudhury, 1997) in India, which enable investors to start up software development ventures with minimum time and effort.

Appropriate Policy Support

Incentives

Government of India recognised the potential and importance of the IT industry as early as 1986 and formulated a software policy and a number of incentives ranging from tax holidays, zero import duty for capital goods, exemption of exercise duty on local purchases, special import licenses, treatment of foreign investments on par with their Indian counter- parts, freedom for foreign enterprises to remit profits and repatriate capital subjected to foreign exchange considerations, provision of tariff structures on par with international norms to provide level playing fields and automatic clearance of FDI proposals (Mehta, 1998; MSPL, 1998). In addition already 19 out of 26 State Governments have formulated policies in line with that of the Central Government of India (Nasscom, 2000-b).

Minimum Bureaucracy

Government of India has taken many measures to simplify investment approval and export procedures.

Legislation

India made major amendments to its Copyright Act of 1957, during 1994. It is now illegal to make, distribute, sell or hire copies of copyrighted software without specific authorisation of the copyright holder. This Act also provides jail terms up to three years and fines up to Indian Rs.200, 000. (MSPL, 1998). However United States Trade Representative (USTR) has included India within the "Priority Watch List" countries with less than adequate and effective Intellectual Property Rights (IPR) protection, as at September 2000 (ITDS, 2000). India therefore has to further improve its IPR issues. Software piracy is considered a major issue to the industry as it is estimated that out of new business software applications installed worldwide in 1998, 38% were pirated (ITDS, 2000).

Other

Huge Domestic Mar..

India has a huge domestic market. Latest policy document emphasises heavily on significant Government expenditure on e-governance thus boosting the domestic software market (Indian Govt, 1999-a). Availability of large private sector corporations too contributes a substantial share to the domestic market. In order to sustain software exports, a vibrant domestic market is very much desirable (Metha, 1998).

Access to Leading Markets Abroad Through Expatriates

There are 974 software companies headed by Indians in US Silicon Valley and most of them assign their development work to subsidiaries back home (Kundi, 2000).

The time difference of 12 hours with the USA, the world's largest market is an advantage which enables US companies to establish round the clock software factories by subcontracting to Indian software companies (Infoline, 2000).

Up to Date Hardware and Software

Due to it's late start, Indian companies made significant investments on IT much after the developed nations. Therefore it is not left with outdated hardware and software (Infoline, 2000).

Lessons from the Indian Experience

The economic and social benefits arising from India's success in the IT sphere are many. There are benefits both tangible and intangible. The direct employment generated, export income, foreign exchange earnings etc. are the tangible ones. The intangible benefits such as re-direction of HRD from conventional areas, opportunity to induce IT applications in the domestic economy and more significantly the gradual "E" capacity development would generate more long term and longer lasting benefits.

Table 2 - Potential tangible benefits Sri Lanka can generate by following the Indian success

	India	Sri Lanka
Software exports - 2000	US $ 4.00 billion [a]	US$ 20 million [c]
G.A.G.R of exports during last 1995 to 2000	62.3% [a]	N/A
Software exports – 2001 (projected)	US $ 6.24 billion [a]	US $ 50 million [c]
Software exports – 2008 (projected)	US $ 12. billion [a]	US $ 750 million [c]
Employment IT professionals – 2000	410,000 [a]	8000 [c]
Employment in IT enabled services – 2008	1,000,000 [b]	50,000 [c]

[a] *(Nasscom-e, 2001),* [b] *(Nasscom, 2000),*
[c] *(Projections based on achievements of India and comparison of enabling factors between Sri Lanka and India shown in Table 4)*

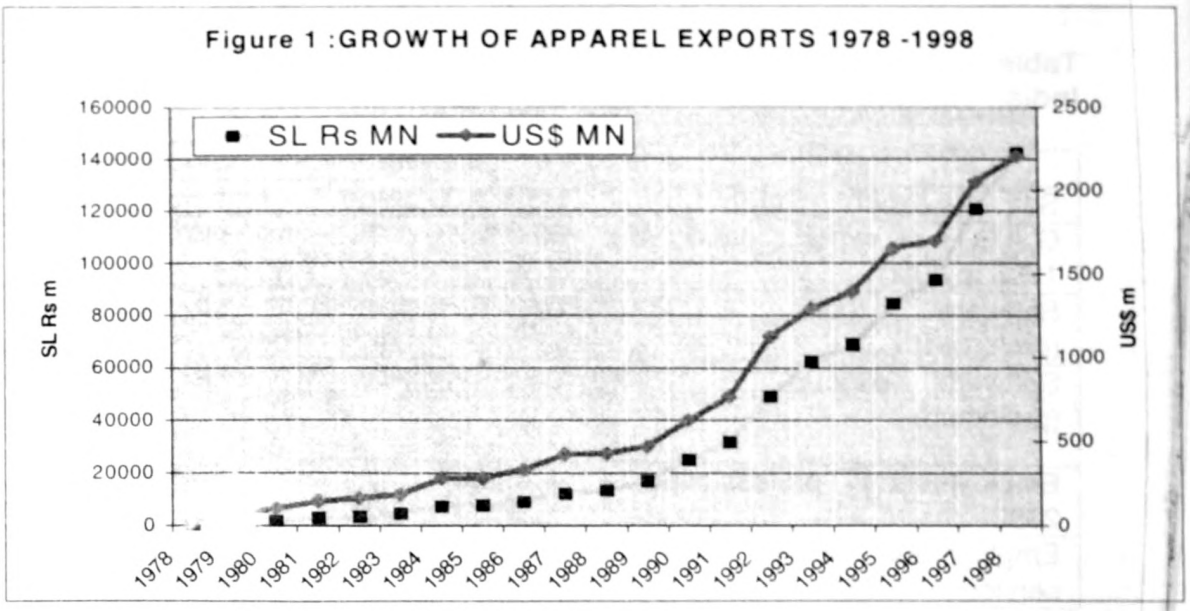
If this development can be achieved, Sri Lanka can also address one of the most pressing political and social problems- the youth unemployment problem. This will also lay the foundation for a knowledge-based workforce and a society.

An assessment of the potential for economic development can be seen by drawing a parallel to the success of the industrial sector in Sri Lanka during the last decade or so. Though the manufacturing sector has grown significantly, the bulk of exported goods from Sri Lanka still originate in labour-intensive, low-skill industries (Lall, 1996), compared to other countries and particularly India. (Table 3).

Table 3 - Share of technological categories in manufacture exports (%)

	Sri Lanka			India			Thailand			Mauritius		
	1980	1985	1992	1980	1985	1992	1980	1985	1992	1980	1985	1992
Resource-	19.7	9.8	13.4	26.5	35.8	28.7	53.9	43.5	20.1	7.1	4.5	4.9
Labour intensive	73.6	80.7	78.2	55.4	44.7	49.6	28.4	36.2	38.3	90.2	90.1	90.6
Scale intensive	6.8	4.1	5.8	11.2	4.7	17.1	4.3	3.2	5.6	0.0	0.0	0.0
Differentiated	0.0	1.2	1.4	4.1	11.9	1.2	13.4	15.6	15.7	2.7	5.3	4.5
Knowledge-based	0.0	4.1	1.1	2.8	3.0	3.4	0.0	15	20.3	0.0	0.0	0.0

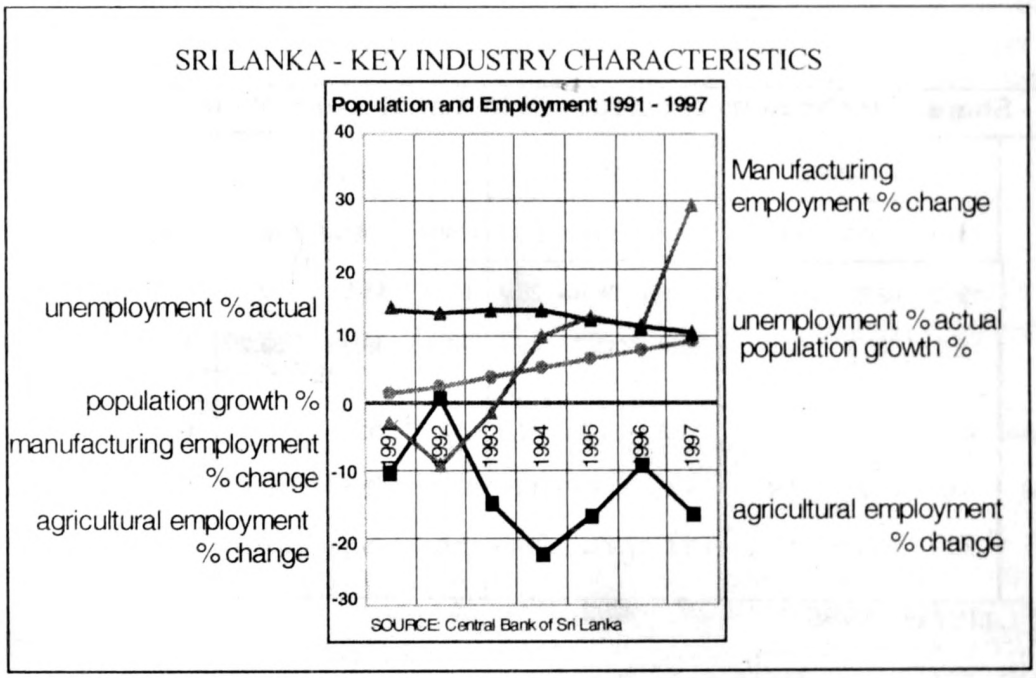
Source: Lall et al., 1996



Source- Textile Statistics of Sri Lanka 1998 (MoID Textile Division)

On the positive side the apparel sector growth (Figure 1) has shown that Sri Lanka has the capacity and the experience to explore economic diversification objectives. The impact on socio-economic factors from the recent economic diversification has been amply demonstrated below. Despite the growth of population, unemployment levels have gradually come down, with the shift from agriculture to industry.

Figure 2: Economic Diversification (agriculture to industry and effect on Employment



Source: Lalith Goonatilake, "Integrated Industrial Development Support programme for Sri Lanka" (UNIDO, 1999)

UNIDO has recommended that the restructuring of Sri Lanka's industrial base must tentatively pursue a two-pronged strategy: a diversification away from the dominance of the garment sector toward higher value-added, skill-intensive areas, and a general deepening of the country's technological capabilities, particularly in the garment sector. The IT sector and the Indian experience offer an ideal opportunity to diversify the economy and address the pressing unemployment problem.

Assessment of IT Support Environment in Sri Lanka

No doubt the success of India in reaping tangible benefits from the IT opportunities are due to a myriad of factors, specific to India as outlined above. Some of these success factors such as domestic market size are specific to India. However, the remainder of the Indian success factors are applicable to Sri Lanka. It would be useful to look at the IT development support environment in Sri Lanka to assess how conducive it is to promote the IT industry. In the Sri Lankan context, a recent survey revealed that the lack of trained manpower and the telecommunication facilities were the biggest hindrance to the growth of the software industry (Munasinghe et. al, 2001). However there are many other shortcomings that have to be overcome, if Sri Lanka is to venture in to the IT industry.

Human Resource Factors

In Sri Lanka only a few public universities and public and private institutes provide high-end education and training. The quantity produced is grossly insufficient to meet the requirements of professionals for even the domestic software industry (Munasinghe et al., 2001). Further, most local universities and institutes do not have sufficient links with the industry nor have they incorporated industry-based training to their curriculum. As a result, most of those who pass out do not meet industry requirements. There are a large number of private institutes, which impart training, in basic literacy in computers and other low-end courses. There is no mechanism of support to improve them, though in the absence of computer education in the school curriculum, they provide a useful service. However there are a few private institutes especially those with foreign links, which provide quality-training courses focussed on proprietary technologies and skill up gradation. A major draw back in Sri Lanka is the absence of a mechanism to check or maintain the standards of computer education, as nationally accepted examinations in computer studies are absent. However on the brighter side Sri Lanka has a large pool of trainable youth who are eligible for university education but have left out due to the lack of places (CDN, 2000-b).

General computer literacy level of white-collar workers, particularly in the public sector is poor. However in addition to the IT personnel, white collar workers also have to accept the computer systems as part of their working environment (Hassim et. al, 1999). This calls for an IT literate society and therefore is another aspect which needs the attention of policy makers.

Education and training in IT too has emerged as a very significant sector. India has targeted to earn US$ 5 billions of foreign exchange by 2005, by providing IT related education and training to other countries (Indian Govt, 1999-c). Based on the general certificate examination (GCE) advanced level held in 2000, 91,589

have qualified to apply for admission to universities in Sri Lanka, only around 20,000 will be given placements (CDN, 2000-b). Thus due to the availability of a large pool of trainable youth in Sri Lanka there is a huge potential for investors to invest in training institutes. The government has to carry out an aggressive campaign to attract reputed foreign establishments engaged in training to start operations in Sri Lanka.

At present there is hardly any penetrations of computers in to the formal education system. National Institute of Education (NIE) has initiated to set up 300 computer resource centres to make those awaiting GCE results literate in computing. Government has also announced a plan to set up computer learning centres in 1000 secondary schools across the country. Further all schools with GCE advanced level classes (amounting to about 2500), are to be provided with computer centres by the year 2003 (CDN, 2000-a). The dearth of qualified trainers and the lack of facilities are the main factors hindering the IT education and training at all levels in Sri Lanka, while information channeled to policy makers is limited since minimal research is being conducted in this area in Sri Lanka.

Infrastructure and Facilities

Based on an IT industry needs assessment done in 2000, lack of or unreliable telecommunication infrastructure was one of the main obstacles for the growth (Munasinghe et al., 2001). As a result Sri Lankan software development industry cannot make the best use of the current developments of telecommunication technology. For example, constant interaction with clients, interaction with different development teams, transmission of data, access to Internet, video conferencing, delivery of products, maintenance and support of products and communication purposes. Lack of telecommunication facilities, which is very much evident in outstations, prevent location of relevant enterprises to take advantage of low rents and provide employment to a large number of youth in these areas. Though Sri Lankan telecommunication facilities lag behind those of developed countries, with a number of private sector telecommunication and Internet providers, it has the potential to develop the facilities within a short time.

Policy Support

Low Cost Funding, Incentives and Easy Investment Approvals

There are a number of attractive financial packages offered by banks. The Government in order to attract and encourage investment in this sector has offered a number of incentives to potential investors both local and foreign. Some of these are: tax holidays of 5 to 8 years depending on the percentage of exports, followed by 12 year concessionary tax and provision to import equipment free of duty. There is no minimum limit of investment to qualify and the only criterion is that the company employs 25 technical personnel within two years of commencement of the project (CINTEC, 2000). BOI Sri Lanka has wide ranging powers vested on it and claims that the process of obtaining investment approval, signing of agreements and the allotment of land could be completed within 45 days for investments located within the industrial zones, and within 5 months for those located outside the zones (Jayaram, 2000).

Local Demand

The present demand created for software by the public and private sector organisations is insignificant. However the Department of Policy Planning has already taken steps to create databases of performances of economic indicators while Department of National Budget too has initiated to computerising the process of preparation of the National Budget including the tedious process of collecting of data from a host of ministries and departments. Computer and Information Technology Council of Sri Lanka (CINTEC) at present is coordinating a National Population Database that would include the registration of births, marriages, deaths, issue of national identity cards, driving licenses and passports. Such a database could also be linked to airports, ports and other law enforcement authorities.

Legal Protection for Intellectual Property Rights (IPR)

Current IPR protection laws in Sri Lanka are not adequate to win the confidence of investors and induce them to subcontract programming assignments and start research and development activities in a country. New legislation has to be formulated and enacted to satisfy requirements demanded by the advancements of IT in a number of areas.

Table 4 - Comparison of above factors with India

		1999/00	2000/01	2001/02
Literacy	India	52%	-	-
	Sri Lanka	89%	-	-
No. of IT professionals	India	410,000 [a]	-	-
	Sri Lanka	8,000	-	-
Total PC base in millions	India	5 [b]	-	-
	Sri Lanka		-	-
PC base with Pentium in millions	India	3.7 [b]	-	-
	Sri Lanka		-	-
No. of fixed phones per 100 (tele-density)	India	2.5 [b]	-	-
	Sri Lanka	4.57 [d]	-	-
No. of internet subscribers in millions	India	1.8 [b]	2.3 [*b]	4.5* [b]
	Sri Lanka	0.04 [b]		
ISPs operational	India	7 [b]	12 [*b]	
	Sri Lanka	27 [d]		
No. of international gateways	India		120 [*b]	
	Sri Lanka	3 [d]	7 [d]	
Value of e-com transactions -I.Rs.Crore	India	450 [b]	2,300* [b]	7,500* [b]
	Sri Lanka			

[a] (Nasscom-e, 2001), [b] (Nasscom-f, 2001), [c] (DoT, 2001), * Projections
[d] Telecom Regulatory Commission of Sri Lanka

Implementation Strategy

In 1983, a committee appointed by National Science Foundation (NSF) formulated the first ever computer policy for Sri Lanka (COMPOL). The Government of Sri Lanka accepted the recommendations of this committee and the CINTEC was established by an act of Parliament (Act no. 10 of 1984). CINTEC functioned under the President. The CINTEC Act recognised policy recommendations and implementations as a major statutory function of CINTEC. The COMPOL recommendations together with recommendations made to the government by CINTEC from time to time formed the IT policy.

The Science and Technology Act of 1994, which became active on 1st April 1998 replaced the above CINTEC Act and replaced the Computer and Information Technology Council of Sri Lanka with the Council for Information Technology, but retaining the well-known acronym CINTEC. This Act provides for policy recommendations to be made by CINTEC to the government through the Science and Technology Commission (NASTEC). Accordingly in January 1999 CINTEC prepared a draft proposal for the National Information Technology Policy. This would to be approved by NASTEC, placed before the government and implemented in 2001.

There seems to be a need for a mechanism that will enable policies to be updated in keeping with the rapid changes of IT and resulting changes of requirements. As otherwise it would stifle the growth of the sector.

The Sri Lanka Computer Vendors Association (SLCVA), Sri Lanka Association for Software Industry (SLASI) and the Association for Computer Training Organisations, are 3 associations under the umbrella of Federation of Information Technology Industry in Sri Lanka (FITIS), all located at CINTEC premises. The BOI has successfully attracted a substantial numbers of investments and Export Development Board (EDB) has enabled the software industrialists to participate in a number of trade fairs and marketing missions. The Sri Lanka Inter University Computer Committee (SLIUCC) attends to relevant activities of the universities.

It is therefore evident that there are a number of formal committees to look after the interests of various sectors. However compared to over 50% annual growth of software sector, witnessed in India over the last decade, Sri Lanka's growth had been insignificant. Failure of Sri Lanka to make significant advancement in software sector was mainly due to lack of foresightedness of policy makers and executioners (Jayasinghe, 2000).

Conclusions

Software industry is acknowledged worldwide to be the fastest growing sector. Throughout the last decade there was a trend for the software industry to move from advanced high wage countries, towards low waged countries in Asia. According to analysts this trend will continue during the coming decade. During the last decade India made the best use of the above scenario and was able increase software exports considerably, to achieve annual growth rate of over 50%. Though Sri Lanka is lagging far behind, it has the potential to improve the enabling factors and make software industry the main foreign exchange earner of the country within a relatively short period.

Ubiquity and access speed of Internet has opened new areas for development of software industry. At present the concept of providing software as a service has created considerable interests among software companies. During the next decade there will be a mass shift from desktop based software applications to Internet or Intranet based online application software available on a recurring fee. The other major drivers of the software industry will be e-business software solutions and the other the web-based interactive software. There is a tendency for Internet-based software to be centred around Java computer language, which allows software to run on any platform regardless of the operating system and also to develop software around the freely available network operating system Linux. IT Enabled Services will be the other major driver in the IT led services industry.

Lack of trained manpower and the telecommunication facilities are the biggest impediments for the growth of the software industry in Sri Lanka. The other enabling factors, which need to be addressed, are the commitment of the government, low cost funding, incentives and simplified investment approvals, promotion of investors and exports, local demand and legal protection for intellectual property rights. To build up a vibrant software industry the government should formulate a sound policy that will strengthen the above enabling factors.

Government policy should be focussed on harnessing resources of public and private sector educational and training institutes with close collaboration with the industry to produce manpower that will meet the rapidly changing requirements of the software industry. Local institutes should be supported with contacts and assistance to bring in foreign trainers, to establish affiliations and obtain accreditations. Globally, education and training is emerging as a major sector and Sri Lanka has a highly trainable pool of educated youth. Therefore Government agencies such as the BOI and CINTEC should carry out an aggressive campaign with very attractive incentives to bring in reputed foreign establishments already engaged in education and training. Action has to be taken at all levels to develop an IT literate society. In addition to strengthening formal education system private training institutes already available across the country too should be assisted by promoting the franchisee model. These institutes and private communication bureaus should also be provided with communication facilities and access to Internet at reasonable rates, to enable them to open cyber cafes. Making the best use of electronic learning, establishing educational Intranets and nationally accepted examinations are some of the other measures to be taken towards an IT literate society.

The software industry is very much dependant on telecommunications facilities for, constant interaction with clients, interaction with different development teams, transmission of data, access to Internet, video conferencing, delivery of products and maintenance and support of products. With the current development of electronic learning and the need to access Internet, telecommunication facilities are also vital for education and training in IT, which is a prerequisite for a successful software industry. Policy measures, therefore has to be taken to develop the telecommunication infrastructure with adequate bandwidth, international connectivity, coverage, reliability, and service levels at reasonable rates to be on par with global standards. Setting up fibre optic and wireless networks to be accelerated to support implementation and usage of Internet and Intranets. Sri Lanka telecom should take steps to expand its Integrated Services

Digital Network (ISDN) coverage and to provide nodes for Internet connectivity at all local charge areas.

Areas should also be earmarked with concentrations of educated youth for setting up Software Technology Parks. IT education and training facilities should be encouraged in these locations while investments is channelled to develop telecommunication infrastructure.

Government should continue with the reasonably attractive incentive packages already in place. BOI and EDB have to launch aggressive market and investment promotion programmes. Government also has to implement a sound electronic governance programme to streamline its activities. Such a programme will also boost the local demand for software. Legislation has to be formulated and enacted to satisfy requirements demanded by advancements of IT and IPR protection required to win the confidence of investors.

CINTEC led by a professionally qualified dynamic person could continue to be the apex body. CINTEC should act as a facilitator and an enabler rather than a controlling body and encourage private sector to drive the development of software industry with assistance from BOI and EDB. A mechanism to formulate policies and implement them, which can keep pace, with the rapid developments of IT has to be established.

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