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RIS Discussion Papers

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India-ASEAN Cooperation in Information and Communication Technologies: Issues and Prospects

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Abtract: Against the backdrop of India-ASEAN cooperation since the early 1990s, and the recent initiatives towards taking the partnership to new heights, the present paper examines India ASEAN cooperation in IT during the recent past and highlights the prospects for the future. It has been argued that India-ASEAN cooperation could be instrumental in addressing the ASEAN divide – the development gap between old and new ASEAN countries. For India, it could help diversifying its software export markets on the one hand and facilitate reviving its lagging hardware sector. Also, an exploitation of the synergies between India's software capability and the hardware capability of old ASEAN could facilitate enhancing the IT capability in Asia as a whole – a prerequisite for making 21st century Asia's century. While, a good beginning has been made at the instance of Governments and private sector, the paper calls for hastening the process and highlights certain specific areas for focused actions.

Because of its ability to increase productivity of various economic sectors and also due to its key role in forging a new economic paradigm to usher in a knowledge-based economy, ICTs cluster poses tremendous importance to all

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nations. India's recent emergence as an IT powerhouse in the area of software and IT-enabled services has been geared towards meeting the demands of external players like the United States. Although IT export adds to India's growing foreign exchange reserves and creates large number of jobs, India's existing IT policy of export dependence needs to be revised. India needs to develop an internal demand driven IT industry and it must also broaden its export market to more reliable economic partners within the region. At the same time there is great interest among ASEAN countries to forge stronger economic and technological relationship with India. India is also following a look east policy to develop economic, political and cultural relationship with its neighbours in the ASEAN region.

It is in this context that we look at the challenges and opportunities for cooperation between India and ASEAN in the area of ICTs. In section one of the paper, we look at the importance of ICTs in economic growth and development. The rest of the paper is organized as follows; the second section presents the background for IT cooperation by taking stock of India-ASEAN relationship during the last decade. The third section presents certain factors from both ASEAN and India perspective that provide a conducive environment for mutually beneficial cooperation. The fourth section makes an empirical analysis of the recent trends in India-ASEAN cooperation and the final section presents some concluding observations

Theoretical Framework

In countries or regions within countries where ICTs have become part of the economic infrastructure, firms and business organizations, regardless of their size or spatial-temporal location, have experienced steep decline in transportation, communication, search, and distribution costs. The information revolution ushered in lower transaction costs, greater competitiveness, and lowered entry barriers for businesses where fixed costs are usually low (Guha, 2003). The development and diffusion of ICTs, *inter alia,* by minimizing transactions costs have become a source of comparative advantage of nations (James, 2001). The assumption, hitherto, that the standard Heckscher-Ohlin model of international trade, where comparative advantages in factor and resource endowments held away, has been replaced by the finding that comparative advantages are driven by international differences in production functions due to innovation and rapid technological change (Krugman, 1995). The major driving force for technological change in contemporary production functions emanate from ICTs and biotechnologies, especially, the former. Thus

the advances in information & communication and related innovations have spawned a new form of comparative advantage and international division of labor in the global economy. These factors have facilitated the emergence of developing countries like India and some ASEAN countries as major players in ICTs. This is unlike the earlier transformational technologies, wherein only the developed economies had the needed capabilities. While the new technology has the potential to enable developing countries to leapfrog, it also poses a potential threat. If developing countries fail to harness IT for comprehensive economic and social development, they are likely to lag behind developed countries because of the aggravating development divide between them.

There is hardly a country in the developing world that has not embraced ICT as a short cut to prosperity. Accordingly, new institutional mechanisms and policy measures have been initiated not only to develop ICT capabilities but also to harness the power of this new technology cluster to accentuate the process of socio-economic transformation. The reality, however, is that the capability to develop and diffuse ICTs for development is unequally distributed due to inherent structural problems in developing countries. Yet, the policies and institutional interventions in the developing world, in general, appear to be to emulating their counterparts in the developed world without taking into account their specific contexts. The result appears to be that these countries turn out to be less successful in taking advantage of the full benefits from connectivity and ICT capability. For example, India's recent advances in the IT sector were mostly geared towards taking advantage of external market stimulation, which in turn is said to have had adverse effect on other sectors of the economy that compete for skilled manpower (Joseph and Harilal, 2001). The stimulus for the expansion of IT industry in India was to meet the demands of advanced industrialized countries, especially the United States. Domestic demand driven ICT growth was slow to develop. India has a potential to develop products and services to satisfy demands within as well as that of ASEAN countries. The old ASEAN Member countries (ASEAN-6) are known for their manufacturing capabilities in a range of IT goods. Yet these synergies between their capabilities are yet to be tapped fully. Similarly, new members of ASEAN (Cambodia, Lao PDR, Myanmar and Vietnam), the ASEAN-4, have made institutional interventions and policy measures to develop and harness IT for development. Their policies, following the IT policies in developed countries, aim at building up IT infrastructure, developing IT manpower and promoting IT use. Given the fact that these countries are constrained by their limited technological and financial capabilities, there is immense scope for cooperation with countries like India to build up the needed

capabilities. But this aspect is yet to receive the attention that it deserves. History teaches us that the development of technological capabilities in the developing world has been a combined outcome of import of technology and its adaptation and up gradation though in-house R&D effort. It is against this background that the present paper explores the issues and possibilities of IT cooperation between India and ASEAN.

India-ASEAN Cooperation in ICTs: The Background

India had an option to joining the ASEAN when it was formed in 1967. But due to the prevailing political environment of the time and India's stated foreign policy of "non-alignment," India chose not to join ASEAN (Sachdeva and Wadhava, undated). But by early 1990s, as part of its globalization process, India initiated its "Look East" policy, which involved developing closer relations with the ASEAN. This short time span of India-ASEAN relationship has recorded significant progress. This began with India's position as a sectoral dialogue partner, and culminated with the signing of the framework agreement on Comprehensive Economic Cooperation between India and ASEAN in October 2003. Simultaneously, with fast growth in trade and investment relations, India has also been fostering bilateral relations in a wide range of areas with almost all the ASEAN member countries. While new developments in the global trading environment in the last decade provided a fertile soil for regional economic integration, the leap forward in India-ASEAN relationship should be seen in the context of the congruence in their development philosophies as well as their fostering economic and trade relationship with rest of the world.

From the Indian side, the period witnessed major changes in India's overall development strategy as manifested in its greater economic integration with the rest of the world. More specifically, in the early 1990s India adopted the "Look East" policy to foster stronger relationship with its East Asian neighbours. There has also been perceptible change in India's image among other countries as an emerging economic power with a large domestic market and open trade and investment regime. Moreover, India has been recognized as a major player in the field of Information technology — a technology considered instrumental in the economic and social transformation of all countries in the new millennium. India's policy of external integration has given rich dividends in terms of, but not limited to, almost 50 percent increase in its share in world trade, more than 15 fold increase in the inflow of Foreign Direct Investment (FDI), and, above all, an unprecedented build up of its foreign exchange reserve to over $100 billion by the end of 2003. Drawing from past experience, India's 2020 vision aims at fostering closer relationship with all major countries in the world, and,

particularly, with countries in the region in the years to come. According to the Report of the Committee on India Vision 2020, "India's progress over the next 20 years will be intimately linked to events within the region as well as around the world" (Government of India, 2002a).

ASEAN today comprises of a highly heterogeneous group of countries with varying levels of development. While the old members of ASEAN have been successful in achieving higher growth performance, facilitated *inter alia,* by greater economic integration with the rest of the world, the new entrants with the possible exception of Vietnam, exhibit the characteristics of least developed economies with high dependence on the primary sector. Concentrated on an export basket of agricultural and extractive primary commodities with limited comparative price advantage and low levels of social sector development, these least developed ASEAN members need urgent technological up gradation to improve their economic fortunes. Not only that their per capita incomes are at a much lower levels as compared to ASEAN-6, these countries also face serious external payment problems as evident from their relatively high trade deficit. ASEAN-6 countries have been successful in developing production base and export competitiveness in a wide rage of activities. They have also acquired product development and marketing capabilities in a range of medium and high technology industries. Particularly notable is their production capabilities in electronic and telecommunication equipment, heavy engineering, capacity in the construction and management of infrastructure.

At the same time, the old members of ASEAN are also conscious of the weakness of their economic structure built up over the years. Today, there appears to be a consensus in terms of the need for a shift away from the strategy of "investment-led growth" to "innovation-led growth," and from value-adding industries to value-creating industries. Hence, Vision 2020 for the ASEAN envisions "a technologically dynamic ASEAN competent in strategic and enabling technologies, with an adequate pool of technologically qualified and trained manpower, and strong networks of scientific and technological institutions and centers of excellence" [1]. As regards the new entrants to ASEAN (CMLV Countries or ASEAN-4), given the lower levels of development, ASEAN vision for 2020 underlines the need for bridging the development gap between the old and new members of ASEAN. This new vision is manifested in the Initiatives for ASEAN integration, wherein informational technology has been considered as strategic instrument for bridging this gap. An indication of the

importance given by ASEAN to new technology is evident from the fact that IT is identified as one of the four components of the Initiative for ASEAN Integration as well as for narrowing the development gap between the older and the newer members.[2] More importantly, ASEAN envisages India's cooperation in bridging the ASEAN divide as is evident from the fact that one of the objectives of the Comprehensive Agreement for Economic Cooperation signed by ASEAN and India is to facilitate more effective economic integration of the new ASEAN member states and to bridge the development gap among the parties[3].

Thus, if India's look east policy is well conceived and successfully implemented, it would certainly yield rich dividends in terms of more intimate relationship between ASEAN in general and individual member countries in particular in a wide range of areas. Hence the future appears to be more optimistic in terms of fostering a mutually beneficial relationship with ASEAN (RIS 2004)[4].

Factors Inducing IT Cooperation: An ASEAN Perspective

India and the old ASEAN member countries are known for their differential capabilities in ICTs. India's capability in software and the old ASEAN countries' capability in hardware manufacturing provide a highly fertile environment for mutually beneficial cooperation. But with the entry of new members in ASEAN, further opportunities for cooperation are opened up. There are thus, certain factors, both from ASEAN and India, which provide added inducement for cooperation. We highlight these factors below.

Let us begin with the ASEAN side by examining the present state of ICT infrastructure and ICT use in ASEAN (see Table 1). From table it is evident that there is a significant difference between the old and new ASEAN member countries in terms of their IT infrastructure and use.

With respect to IT infrastructure, it may be noted that the number of fixed telephone lines per 1000 people even in the largest city of the new ASEAN member countries is lower than the national average for the old ASEAN countries. When it comes to mobile telephones, computers and Internet, the divide between the old and new ASEAN countries is much wider. In general, in terms of ICT infrastructure and use, while the old ASEAN member countries are found to be either on par with or at a higher level than the middle-income countries, the new ASEAN member countries lag not only behind their counterparts but also behind the low-income countries in general. Here, Vietnam appears to be an exception.

Table 1: Indicators of ICT Infrastructure and use in ASEAN countries (2001)

ASEAN Member Countries	Telephone Mainline				Mobile Phone Per 1000 People	Personal Computer Per1000 people	Internet Users (000)	Information and Communication Expenditure	
	Per 1000 People	In Largest city per 1000 people	Waiting time year (2000)	Cost of local call per 3 minute ($)				% of GDP	per capita $
Old ASEAN									
Brunei	35	261		0.02	31	11	4000	2.2	17
Indonesia	196		0.7	0.02	314	126.1	6500	6.6	262
Malaysia	42	265		0	150	21.7	2000	4.2	41
Philippines	471	471	0	0.02	724	508.3	1500	9.9	2110
Singapore	99	452	1.6	0.07	123	27.8	3536	3.7	76
Thailand									
New ASEAN									
Cambodia	2	19		0.03	17	1.5	10	-	-
Lao PDR	10	65	1.1	0.02	5	3	10		
Myanmar	6	32	5.3	0.01	0	1.1	10	-	-
Vietnam	38	-	-	0.02	15	11.7	1010	6.7	26
Low Income	30	130	1.4	0.05	10	6.1	15932	-	-
Low Middle Income	93	270	2	0.04	72	21.6	112591	-	
High Income	593	-	0	0.08	609	416.3	388888	-	-

Source: The World Bank (2003) *World Development Indicators*, The World Bank, Washington DC.

To address this issue there have been initiatives at the individual country level and at the regional level. At the country level, all the new ASEAN (CLMV) countries have made a series of institutional arrangements and policy measures, which in general aims at building up ICT infrastructure, ICT production base, human resource development and promoting the use of ICT in different sectors of economy and society. A careful reading of ICT policies, which are at different levels of formulation and implementation, in these countries tends to suggest that the policies are framed almost by emulating the policies being adopted in other developed countries. The central pillars of ICT policy in these countries remain the same as in the case of any other developed countries. It needs to be noted that the central issue is one of capacity building in technology. Literature on technological capability building in developing countries has shown that it is a combined outcome of technology transfer through different means and domestic technology generation. Hence, the ICT policies of these countries need to give due importance to making effective use of capabilities available at other countries through strategic cooperation.

The role that India could play in the CLMV countries could be best highlighted by recalling some of the conclusions of a recent study (Joseph, 2004a) on the IT sector in the GMS (Greater Mekong Sub region). The new ASEAN member countries are highly committed to developing an IT base and harnessing ICT for their development. Major initiatives have been made in these areas during the past several years. Nonetheless, given the gigantic task at hand and the rocky road through which they have to traverse, the destination still remains far away. Thus, there is a challenge and also opportunities. It has been found that IT use in these countries (with the possible exception of Vietnam), in terms of telecommunication network (fixed or mobile) and internet use, is confined to the urban areas leading to what is called the "intra-national digital divide". To address this issue there is the need for, among others, a concerted effort to build up IT infrastructure and human capital which is important not only for generating needed local content but also for enabling people to make use of the new technology. With regards to the generation of high quality human capital there is the need for (a) an accreditation scheme for the different institutes and training centers for imparting IT knowledge, (b) reviewing the present approach of "training the trainers," because this approach is based on the basic premise that all those who are trained will be willing and able to train others, and (c) creating more training facilities within the country, in association with existing renowned universities and institutes in the region. In all these aspects cooperation with India could pay rich dividends.

To the extent that the intra-national digital divide is a manifestation of the low affordability on account of the low purchasing power and higher price of computer hardware and software in relation to the per capita income in these countries, there is the urgent need for cooperation with countries like India which is known for its IT capabilities to make effective use of free or open software. More importantly, India is known for a number of IT initiatives that address the rural poor through the initiatives of different of the Central and various State Governments, Civil Society Organizations (CSOs) and the private sector. These least developed ASEAN countries could learn by cooperating with India. Given the fact that the IT production base in these countries at present is negligible there appears to be a need to develop an IT production base so that IT use is facilitated and new avenues of employment and income are created.

Since the domestic private sector, for historical reasons, is in its infancy in these countries, there appears to be the need for further targeted efforts to develop a domestic private sector. This process could start by reviewing and abolishing policies that are present today which discriminate the local capital vis-à-vis their foreign counterparts. Given the fact entrepreneurs are "not only born but also developed", special emphasis must be given to create and nurture an entrepreneurial class in the country through Entrepreneurial Development Programs (EDPs). Here again India could play a major role.

In Information Technology the private investment today, though limited, is confined to the telecom services and IT training sectors. Though there are limits set by the international environment in which IT production is being organized, the new ASEAN countries could consider entering in the production of low level IT products like IT entertainment goods, IT components like peripherals, electro-mechanical components and IT enabled services. While venturing into such initiatives, it is important to keep in mind the lessons offered by the experience of other countries.

To begin with, the strategy needs to be not one of spreading thinly the resources across the country rather the investment needs to be undertaken in such a way as to take advantage of agglomeration economies. This might be possible through the setting up of Technology Parks, with the help of both India and the old ASEAN member countries, wherein, built up space, communication infrastructure and others, which are beyond the reach of an

individual entrepreneur is provided along with a "single window clearance" system so that the prospective investors need to have only limited interaction with the bureaucracy. India has rich experience with its Software Technology Parks, which could be a source of leapfrogging for the new ASEAN.

Secondly, such technology parks needs to be close to and have constant interaction with the centers of learning such that mutual learning and domestic technological capability could be built up in the long run.

Thirdly, there is also the need for conscious efforts towards skill empowerment such that the economy does not get locked up in low technology activity and an upward movement along the skill spectrum is ensured. Given the fact that skill empowerment is bound to bring about substantial social benefits, its cost cannot be left entirely to the private sector and must be shared socially. This could be accomplished, perhaps, through providing additional incentives for firms undertaking such initiatives. Here again, one of the constraints appears to be the availability of skilled manpower and infrastructure. While the Old ASEAN member countries are well positioned to address the issue of infrastructure and helping to develop ICT hardware production base, India could play a significant role in developing the needed human capital and software base.

Challenges for India: The Need for a Look East Strategy in IT

One of the often-cited achievements of Indian economy during the last decade has been the emergence of India as a global player in the ICT sector, which has shown remarkable vibrancy in terms of output and export growth[5]. If the available statistics is any indication, the ICT software and service export from India recorded an annual compound growth rate of the order of over 60 per cent in rupee terms (at current prices) and around 45 per cent in dollar terms during the last decade. This is unprecedented not only in terms of the magnitude of the observed growth rate but also in terms of its stability. As a result, about 600,000 persons working in India's information technology sector today create $16 billion worth of wealth every year. Estimates show that IT exports are likely to touch $10 billion this year, in spite of recessionary conditions in the principal markets, accounting for over one-fifth of India's total exports. India exports IT and IT-enabled services to over 133 countries and the Indian firms are training people in IT in 55 countries. A single Indian firm - NIIT - today runs 100 training centres in, of all places, China! The Government of India itself is setting up training centres in other countries. While there have been apprehensions

about Indian IT firms focussing on low end of the IT value chain, a recent analysis has shown that India is moving up very fast on the value chain (Joseph & Abraham, 2002). More evidently, India is today one of the principal knowledge-generators in this field - over 100 of the Fortune 500 companies have set up R&D centres in India. Among these are some of the world's cutting-edge IT firms - Intel, IBM, Microsoft, Motorola, Hewlett Packard, SAP, Sony, Samsung, and Texas Instruments. Each of them relies on and seeks to avail of India's strengths in IT[6]. Many more such credentials could be added to India's IT strength. These achievements become all the more striking when considered against the fact that it has been achieved almost entirely by local firms[7].

However, there are at least two challenges that deserve attention here and IT cooperation with ASEAN could be instrumental in addressing them. The first one relates to the direction of IT software and service exports of India and the second one pertains to the weakening IT hardware production in the country. Let us begin with the first issue.

Perils of Excessive regional Concentration

Table 2 presents data on the country-wise exports of India's IT software and electronics. It is evident that unlike hardware (we mean electronics), which has a highly diversified export market there is very high regional concentration in software exports. As is evident from the table, two countries, USA and UK together, accounts for over 68 per cent of total software exports and the share of US alone is as high as 62.5 per cent. While Singapore is the fifth largest market for India's software, its share is only a little over two per cent, whereas it accounts for as high as 11 per cent of the hardware exports. Similarly, Malaysia is a major destination for hardware exports accounting for as high as 15 per cent of the total exports whereas its share in total software exports is less than 0.5 per cent (more on it later). The high regional concentration, needless to say, makes India's exports highly susceptible to developments in one or two countries. The slowdown in the US economy has had a significant adverse effect on India's software export in the post 2001 period. The recent move by the US against outsourcing from India cannot but have its implications on the fortunes of India's IT sector in the near future. There is, therefore, an urgent need for India to move away from the strategy of putting all the eggs in one basket. In diversifying the export market, the ASEAN countries, on account of the growing demand, is an ideal destination for Indian firms. Further, given the similarity in demand structure, greater focus on ASEAN is likely to provide an opportunity for scaling up many of the IT projects being undertaken in India.

Table 2: Country wise Export of Software from India (2001-02)

Country Name	Estimated Export of S/W	Share of Total S/W Exports	Estimated Export of Elec. H/W (US $ Min.)	Share of Total Electronics Exports
	(US $Min.)	(%)	(US $Min.)	(%)
USA	4784.59	62.53	250.94	20.64
United Kingdom	1215.82	15.89	51.84	4.26
Singapore	159.31	2.08	134.19	11.04
Germany	239.82	3.13	45.55	3.75
Japan	236.96	3.10	42.36	3.48
Malaysia	32.37	0.42	186.76	15.36
Netherlands	61.05	0.8	88.16	7.25
Hong Kong	74.49	0.97	58.86	4.84
Canada	121.43	1.59	6.73	0.55
Belgium	100.68	1.32	10.78	0.89
Other Countries	625.48	8.17	339.75	27.94
Total	7652	100	1215	100

Source: Source: Electronics and Computer Software Export Promotion Council (2002), *Statistical Yearbook of Indian IT and Electronics Industry, 2002*. ESC, New Delhi.

Booming Software but Lagging Hardware

The second aspect relates to the progressive weakening of IT hardware production in India. India is one of the pioneering countries in the developing world to develop an electronics production base and it has a highly diversified product structure with more than 3000 firms engaged in the production of a wide range of electronic consumer goods, electronic capital goods and intermediates (Joseph, 1997; Joseph, 2004b). However, during the recent years while the software sector has been experiencing unprecedented growth rates, both in exports and production, electronics industry in general and computer hardware production in particular, has been lagging behind (see table 3). The growth rate of electronics production in the country has not even kept pace with the overall growth of the economy. Such a dismal performance of electronics industry in recent years needs to be seen against the fact that during the 1970s and 1980s recorded growth rate of electronics industry was head and shoulders above the industrial sector in general and the manufacturing industries in particular (Joseph, 1987). The booming software sector with lagging hardware needs to be a major point of concern particularly because, of late, China has been emerging as a major competitor to India in software. Given the solid hardware base, China is perceived to have high potential for growth, which in turn calls for strengthening India's hardware base to sustain its current comparative advantage. Given the long experience and competence of ASEAN with respect to hardware production, the possibilities of cooperation are too obvious.

While India is not gaining in IT hardware production, there is another side to the story which should be of considerable interest in the context wherein ASEAN is shifting from investment-led growth path to Innovation-led growth path. A number of high technology hardware products are being designed in India for the global market. High end IT products and components like Philips DVD video codec, Apple iPod audio codec, Texas Instruments' OMAP, Microsoft's JSharp, Adobe reader for Palm and iPaq, Intel's ''start up'' utility, Cisco's IOS core components, Hewlett Packard's ux, OpenView kernel, components of Oracle's Pro-c, to list a few, are developed in India. MBIL is the third largest global optical disk manufacturer; VXL Instruments is the third largest global terminal manufacturer; HiCal supplies magnetics for the world's foremost mobile handset manufacturer, Implusesoft. The Manmar Imaging software for ultrasound scanners and Purple Vision's signal processor are also produced in India (Shourie, 2004b). The message is clear - with India and

Table 3: Recent tends in the Production and Export of India's Electronics Industry ($ Million)

Products Category	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	ACGR
Consumer Electronics							
Production	1830.99	2026.67	2216.87	2604.65	2510.87	2662.47	7.77
Export	185.9	98.67	102.41	104.65	134.78	146.75	-4.62
Communication & Broadcasting							
Production	845.07	866.67	1060.24	1209.3	978.26	943.4	2.22
Export	91.27	80	60.24	41.46	126.09	31.45	-19.19
Instruments & Strategic Electronics							
Production	1239.44	1080	1108.43	1209.3	1250	1331.24	1.44
Export	49.58	64	42.17	39.53	121.74	199.16	32.06
Computer Hardware							
Production	771.83	746.67	554.22	581.4	739.13	733.75	-1.01
Export	375.49	293.33	72.29	139.53	260.87	377.36	0.09
Electronics Components							
Production	1042.25	1173.33	1144.58	1209.3	1195.65	1194.97	2.77
Export	179.44	213.33	216.87	279.07	397.39	461.22	20.78
Total Hardware							
Production	5729.58	5893.34	6084.34	6813.95	6673.91	6865.83	3.68
Export	881.68	749.33	493.98	604.24	1040.87	1215.94	6.64
Computer Software							
Production	1890.99	2738.67	4204.82	5697.67	8021.74	10090.99	39.79
Export	1158.59	1813.33	3012.05	4023.26	5978.26	7651.99	45.87

Source: Electronics and Computer Software Export Promotion Council (2002), *Statistical Yearbook of Indian IT and Electronics Industry, 2002*, ESC, New Delhi.

ASEAN joining together by exploiting their synergies and leveraging their hardware and software capabilities could create a mutually profitable high technology markets and enhance the overall level of technological competence of the region.

The Recent trends in IT Cooperation and the Way Ahead

The growing synergy between India and the ASEAN has been well recognized by policy makers and academia.[8] As early as in 2000, India called for India-ASEAN cooperation in "IT for development" and, subsequently, there have been a number of initiatives at the bilateral and at the level of ASEAN to deepen the cooperation in information technology sector. While delivering the Eleventh India-ASEAN Eminent Persons lecture on January 9, 2001 in New Delhi, ASEAN Secretary General, Rodolfo C. Severino highlighted the significance of ICT cooperation between India and ASEAN. According to Severino,

> "India has swiftly acquired fame for its software industry. ASEAN has its e-ASEAN programme. For all of India's success and despite pockets of achievement in ASEAN, both India and ASEAN, except for Singapore, lag far behind the developed countries in terms of the usage and penetration of IT. ASEAN and India could work together in evaluating their state of readiness for the digital age and identify areas where action is needed and what action to take. This effort could include an index of readiness and an annual progress report. ASEAN and India ought to cooperate in the absolutely essential endeavour of producing the necessary critical mass of trained personnel through the maximum use of the private sector. ASEAN and India could establish a process of consultation on the use, experimental to begin with, of IT for education, health care, employment, small and medium enterprises, and rural development. Because IT is evolving, and evolving fast, we might set up channels for the regular exchange of experience and information on IT developments." (Severino Jr R.C., 2002)

Many ASEAN heads of states had declared their intention of making their countries members of the "rich man's club" by 2020. This vision has been reflected in a more pragmatic foreign policy with respect to potential partners like China and India. Hence ASEAN found it of great importance to launch a "Look West policy" primarily focusing on India (Sahai, 2003). The description of India by the Prime Minister of Singapore as one of the wings of ASEAN jumbo jet may be seen in this context (the other wing being China).

India has already taken bold steps in the spirit of Initiatives for ASEAN Integration as manifested in the unilateral trade concessions offered to CLMV countries. The India-ASEAN vision document (RIS, 2004) states that an area wherein substantial progress has been made and could be instrumental in further forging India-ASEAN relations is in the fields of Science and technology and human capital development. Here, greater focus, in the short run, may be on IT - an area where India is acclaimed for its competence as argued earlier. There have been a number of initiatives both at the bilateral and multilateral level to deepen India-ASEAN relations IT. Some progress has already been made in terms India's presence in most of the ASEAN countries in the field of IT training and software development, provision of IT training for the officers from CMLV countries in India, provision of fellowship for ASEAN candidates to pursue IT education in India - to list a few. These measures seem to have had the effect of sowing the seeds of credible long-term relationship between India and ASEAN. Also, some of the ASEAN countries are major exporters of IT hardware to India. Furthering the initiatives already made, India could be instrumental in working together with ASEAN countries to address the challenges of digital divide for mutual benefit. This will call for collective efforts to promoting e-governance and e-commerce as well as for forging a knowledge-based economy. ASEAN-India cooperation should also be instrumental in establishing synergies between India's software capabilities and the hardware capabilities of ASEAN and thus leading to new business opportunities and capability building for both India and ASEAN (RIS 2004).

An important initiative has been the setting up of ASEAN India Digital Archive (AIDA) by ERNET on behalf of the Department of Information technology in collaboration with ASEAN counterparts. The project involves archiving 6000 multimedia elements, 200 common words and 11 common phrases (Government of India 2002b). The present state of IT cooperation between different ASEAN member countries is summarized in table 4. While the picture presented in table 4 is not all inclusive, it is obvious that there is significant inter country variation in the present level of cooperation.

The table clearly indicates that while there is cooperation between India and all the member countries at least in one or two areas, the relationship between India and Singapore has forged much ahead followed by Malaysia. Also one is tempted hypothesize that the present interface is facilitated more at the instance of MNCs as part of their globalization of production process and also by the emerging international division of labour. Local firms are yet to catch up with these emerging developments.

Table 4: Present state of IT cooperation between India and ASEAN countries: An Indicative list of Initiatives in Cooperation

Country	Current state of IT cooperation
Singapore	MoU Signed. A task force has been set up to facilitate co-operation in information technology. Mutual recognition of DoE Accredited courses (O and A level) and that of Singapore Computer Society. Cooperate in the field of e- commerce. Discussion going on e-commerce and Digital Exchange. Singapore helping India to become PKI (Public Key Infrastructure) member. Singapore Telecommunications Ltd. (SingTel) and Bharti Enterprises of India has US $ 650 million joint venture to build the world's largest cable network in terms of capacity. The 50-50 venture will build and operate an undersea fibre-optic network with a total bandwidth of 8.4 Terabits per second, capable of carrying more than 100 million conversations simultaneously, the companies said in a statement. It is India's first private sector undersea fibre-optic cable network Star Hub of Singapore has a similar joint venture with Reliance India. In October 21, 2002, Tata Consultancy Services (TCS), Asia's largest software and IT Services company announced that it has signed a Memorandum of Understanding (MOU) with NEC Singapore to explore collaboration in four key areas – security products and solutions, sale of NEC supercomputers, e-Government solutions, web integration and software development. Both companies also hope to explore joint marketing and technology development within this region, including India. Increasing trade in software and hardware. On behalf of the private sector, CII signed a co-operation agreement with the Singapore Confederation of Industry in 1994, and subsequently opened an office in Singapore. Many Indian companies, mainly trading and software companies, have now set up joint ventures and subsidiaries in Singapore to promote their business activities in the region
Malaysia	MoU signed. Foreign Minister of Malaysia and the Union Commerce and Industry Minister of India in their meeting in 2001 decided to deepen the cooperation in the field of IT and the Indian IT companies were invited by the minister to invest in Malaysia. The Indian private sector giant, Reliance Group, has a tie-up with Maxis Communication of Malaysia, Star Hub of Singapore, and Software Technology Park of India to build a submarine cable linking India with Malaysia and Singapore, connecting to the broadband nationwide fiber optic network. India company, NIIT is active in collaboration with Tu Abdul Rzak University.
Brunei Darussalam	Discussion is in the advanced stage for signing the MoU. A special tailor-made Information Technology training programme in India has

Table 4 continued

Table 4 continued

Country	Current state of IT cooperation
	been regularly attended by a group of middle level Brunei officials.
Thailand	The Thailand Government has shown keenness to promote closer co-operation and exchange information pertaining to the Information Technology. The Govt. is interested in setting up of Software Technology Park in Thailand on the lines of STPI India. They also plan to develop a Cyber City on the lines of one set-up in Bangalore. An MOU has been signed between the two countries during the visit of Thai PM to India in November 2001.India-Thai Joint Task Force on IT has also been set up. The understanding on IT with India includes special work permits extensions for Indian IT professionals.A team of experts from India undertook a study on the possible areas of cooperation like sharing India's expertise in STPS, IT manpower development; e-governance and discussions are in progress.
Indonesia	MoU has been signed between the Ministry of Science and technology. In the MoU areas of cooperation also included IT. Indian IT firms like NIIT, however, are active in IT training in collaboration with three universities. However, the Progress has been slow.
Vietnam	India offered Rs 10 Million grant, which has been made use of for setting up of an Advanced center for Information technology in Ho Chi Minh City. The Center deals with e learning IT training, Distance education. Discussion is on for setting up a Digital library. Indian firms like ApTech and NIIT are active in Manpower training individually and jointly with STP like the one in Da Nang. Vietnam's Corporation for Financing and Promoting of Technology (FPT) along with its Indian partner, ApTech, have signed an agreement on training human resources for information technology (IT) at Can Tho University of southern Vietnam
Cambodia	As part of Training CLMV officials on IT and networking 45 Cambodian officers are getting trained in India every year.
Myanmar	MoU has been recently signed. Detailed discussions for identifying specific areas of cooperation is scheduled for the January 11 when the IT minister of Myanmar visits India in connection with the Asian IT ministers meeting to be held in India.
Lao PDR	India extends scholarships and training schemes under the Indian Technical & Economic Cooperation (ITEC) for various disciplines & training programmes. Also 45 Lao PDR Candidates get trained in India in the field of IT software and networking An Indian IT Expert was deputed to Vientiane in June 2003 to examine the possibility of setting

Table 4 continued

Table 4 continued

Country	Current state of IT cooperation
	up an IT Centre in the Lao PDR. The 4th Joint Commission Meeting was held during 23-24th July 2002 in New Delhi. The Indian side also reiterated its readiness to set up an information technology centre in Vientiane. Discussions are on for setting up DoE Accredited Franchisees in Lao PDR.
Philippines	At the official level progress has been slow but fourth Meeting of India-Philippines Joint Business Council - May 23-24, 2002, Manila, recommended IT and Software, among others as areas for cooperation. Indian IT leader Infosys has signed a partnership with Microsoft Philippines and Intel Microelectronics Philippines.

Source: Compiled by the Authors from different sources, including discussion with leading IT firms and officials in different Departments of the Government of India. We do not claim that the projects listed covers all the initiatives.

IT Links with Singapore and Malaysia

An example of IT links between India and Singapore-Malaysia is the tie-up between the Reliance Group, an Indian conglomerate, and Software Technology Park of India and Maxis Communication of Malaysia and Star-Hub of Singapore to build a submarine cable linking India with Malaysia and Singapore. Reliance's undersea cable is the latest in a series of submarine cables, which is targeted at the Indian market. Competition for overseas connectivity through undersea cable is a hot market with three other private consortiums expected to adding 14 terabits per second of additional capacity, almost 300 times the current capacity available in India. The other private parties are Bharati Televentures and Dishnet DSL. Bharti has tied up with Singapore Telecom to land a cable at Chennai, and add around 8.4 terabits per second of capacity. The Chennai-based Internet service provider, Dishnet DSL would add a capacity of 2.56 tbps between Chennai and Singapore, and the Reliance cable another 3 tbps.

A high-level Singapore business delegation visited India in November 2003 to enhance bilateral co-operation in the IT sector, including stepping up of software exports to Singapore from the current level of Rs 2640 million. The delegation, hosted by Electronics and Computer Software Exports Promotion Council (ESC), an autonomous organization under the IT Ministry, also looked at promoting joint venture and alliances in the fields of digital solutions, Internet voice enabling services, and e-commerce. India's software exports to Singapore amounted to Rs 2640 million in 1999-2000 against Rs 2000 million in 1997-

98, making it the second most important market in the East Asian region after Japan. Some of the major Indian software exporters to Singapore include Global Tele-Systems, Tata Consultancy Services (TCS), Infosys, DSQ Software, Pentasoft and Wipro[9]. The Singapore delegation was made up of CEOs and top executives of companies specialising in the areas of healthcare, software, e-CRM, encrypted music and tele-media. Singapore would also plans to outsource 25,000 IT professionals from India to meet the growing demand for skilled workforce in the country.. Singapore also plans to create new training facilities to encourage e-learning and come up with strategies for attracting and retaining talent from around the world and especially Indians, who formed one-third of the Silicon Valley's total IT manpower[10].

Singapore Telecommunications Ltd. (SingTel) and Bharti Enterprises of India has a US $650 million joint venture to build the world's largest cable network, in terms of capacity. The 50-50 venture will build and operate an undersea fibre-optic network with a total bandwidth of 8.4 terabits per second, capable of carrying more than 100 million conversations simultaneously, the companies said in a statement. It is India's first private sector undersea fibre-optic cable network, and in Singapore it will link to SingTel's extensive cable network to the rest of the world. A consortium consisting of Alcatel Submarine Networks of France and Fujitsu of Japan will design, manufacture, install and commission the cable in a 250 million US dollar supply contract. The 11,800 km cable, which will link Singapore, Chennai and Mumbai, is expected to start carrying commercial traffic by the end of the next year. SingTel President and CEO Lee Hsien Yang said the network will not only meet customer needs for

Table 5: Number of Indian Software firms with Offices in ASEAN countries

Country	1998	2002
Singapore	35	48
Malaysia	6	13
Indonesia	1	4
Thailand	2	5
Philippines	1	1
Vietnam	0	2
Total	45	73

Source: Compiled from NASSCOM (2002) *Indian IT Software and Services Directory 2002*, Nasscom, New Delhi.

higher bandwith but it will also "provide the stimulus to drive the Internet and e-commerce activities" between India and Singapore and the rest of the Asia-Pacific region. Bharti Chairman and group Managing Director Sunil Bharti Mittal said the bandwidth would also benefit software companies, call centres, dotcom companies and Internet protocol-based industries. "The added bandwidth will make available an enhanced array of voice, data and business and consumer broadband services, and will create the opportunity for the setting up of Internet exchanges in India", he said. "With this initiative, we intend to put India on the world map, at par with those who provide large bandwidth pipes and offer a world-class business communications network at a competitive price". The fibre-optic cable will use the latest Dense Wavelength Division Multiplexing technology to provide transmission facilities, which can be upgraded to ensure that it can be used for years to come. "It will have a self-healing, completely redundant ring configuration for greater network resilience and route diversity", the statement said. Earlier, in August, SingTel invested $400 million in a "significant minority" stake in two units of the Bharti Group, the largest private telecommunications operator in India, with a combined fixed line and mobile telephone subscriber base of 500,000. SingTel has expressed further interest in investing in infrastructure development and IT in India.

Further Empirical Evidence of India-ASEAN IT Cooperation

Against a background of the bilateral initiatives at the government level and also at the private sector, let us now explore the recent trends in India-ASEAN trade relations in IT software and hardware. Table 5 presents the number of Indian software companies having offices or branches in the ASEAN countries. It is encouraging to note that the number of Indian firms operating in the ASEAN region increased from 45 in 1998 to 73 in 2002. More interestingly, in 2002, the number of firms in Singapore has been more than the total number of firms having operations in ASEAN during 1998. While Singapore seems to have forged much ahead of others in terms of IT business relations with India, the number of firms as reported in the table may be an underestimation with respect to other countries because many of the firms are understood to have their base in Singapore but operate in other ASEAN countries. Hence to get a better picture let us look at the recent trends in software exports from India to different ASEAN countries.

Similar to the number if firms, in terms of export of software also, Singapore is ahead of other countries (See table 6). More importantly, the observed rate of growth of exports to Singapore was higher than the growth rate in India's total

Table 6 Software export from India to ASEAN countries ($ Million)

Countries	1999-2000	Share	2000-2001	Share	2001-2002	Share	2002-2003	Share	ACGR
Indonesia	3.54	4.51	1.13	0.45	12.17	5.55	14.23	5.21	59.00
Malaysia	16.96	21.60	25.03	9.88	32.37	14.75	26.88	9.84	16.59
Philippines	1.89	2.41	2.95	1.16	4.49	2.05	7.92	2.90	61.22
Singapore	54.81	69.81	218.41	86.18	159.31	72.61	209.29	76.59	56.30
Thailand	0.71	0.90	5.96	2.35	10.92	4.98	14.61	5.35	174
Brunei	0.5	0.64	0	0	0.01	0.00	0	0.00	
Vietnam	0.02	0.03	0	0	0.13	0.06	0.34	0.12	
Laos	0.07	0.09	0	0	0	0	0	0	
Myanmar	0	0	0	0	0	0	0	0	
Cambodia	0	0	0	0	0	0	0	0	
Total	78.51	100	253.49	100.0237	219.4	100	273.27	100	

Source: Source: Electronics and Computer Software Export Promotion Council (2002), *Statistical Yearbook of Indian IT and Electronics Industry, 2002*. ESC, New Delhi.

exports of software. However, one cannot afford to ignore the fact that export to other countries has been showing clear signs of dynamism in recent years. To illustrate, exports to Thailand has reached a level of over $14 million from a negligible start during the1999-2000 period. Similar trend could be seen in the case of Philippines and Indonesia as well.

As compared to software, India-ASEAN trade relationship in IT hardware (electronics) appears to be much stronger and more equally distributed across different ASEAN member countries. This is evident from table 7 and 8, which show India's IT exports and imports with ASEAN. With respect to India's exports, following observations could be made. To begin with, share of electronics exports in India's total exports to ASEAN remained more or less constant at around 3 per cent during the last decade, though the share almost doubled in the year 2002 (last column Table 7). The observed trend, however, is more or less in tune with India's total exports. Secondly, in 1991 Singapore accounted for almost 100 per cent of India's exports to ASEAN, whereas by 2002, the share of Singapore declined to a little more than 50 per cent, followed by Malaysia and Thailand, pointing towards a more regionally balanced export structure emerging. Yet, the share of other member countries even today remains negligible.

When it comes to imports (see table 8) it is evident that electronics has emerged as a major item of imports from ASEAN recording an annual compounded growth rate of over 25 per cent. As a result, the share of electronics in total imports from ASEAN increased from about 6 per cent in the early years of the last decade to as high as over 15 per cent (last column table 8). Moreover, similar to exports, in 1991 more than 96 per cent of IT imports by India from ASEAN was accounted for by Singapore. But today Singapore's share is only of the order of 56 per cent, followed by Malaysia (30.4%), and Philippines (6.06%).

However, such an aggregate picture tends to conceal more than what it reveals. If we look at the major importing countries for top 20 export items (see appendix table 1) we see that ASEAN countries like Singapore and Malaysia appear as major importers of 10 of these items. Similarly, in case of products related to computer hardware, of the top 10 items, Malaysia and Singapore again are in the list of major importers of five of these items (see appendix table 2). On the whole, it appears that India's export of IT software to ASEAN has been growing on par with its exports to the rest of the world. However, one or two countries account for much of the growth while others are lagging behind.

Table 7 India's Electronics Exports to ASEAN

(Us $ Million)

Year	Singapore	Malaysia	Indonesia	Thailand	Philippines	Vietnam	Total Electronics
1991	26.95	0.17	0.00	0.08	0.00	0.04	27.24
	(98.9)	(0.62)		(0.29)		(0.15)	(3.15)
1992	11.82	1.70	0.16	0.33	0.00	0.06	14.07
	(84.0)	(12.08)	(1.14)	(2.35)		(0.43)	(1.38)
1993	27.88	0.66	0.28	0.83	0.55	0.69	30.89
	(90.3)	(2.14)	(0.91)	(2.69)	(1.78)	(2.23)	(2.64)
1994	47.25	0.70	0.17	1.16	0.09	0.09	49.46
	(95.5)	(1.42)	(0.34)	(2.35)	(0.18)	(0.18)	(3.18)
1995	71.27	7.51	0.09	1.34	0.12	0.29	80.62
	(88.4)	(9.32)	(0.11)	(1.66)	(0.15)	(0.36)	(4.19)
1996	79.26	37.90	0.95	2.37	0.45	0.37	121.32
	(65.3)	(31.24)	(0.78)	(1.95)	(0.37)	(0.30)	(4.45)
1997	48.26	54.31	0.24	0.81	0.80	0.08	104.52
	(46.2)	(51.96)	(0.23)	(0.77)	(0.77)	(0.08)	(3.60)
1998	31.96	39.34	0.40	0.84	2.04	0.02	73.62
	(43.41)	(52.08)	(0.54)	(1.14)	(2.77)	(0.03)	(2.98)
1999	16.45	7.74	0.22	0.39	0.15	0.12	25.11
	(65.51)	(30.82)	(0.88)	(1.55)	(0.60)	(0.48)	(1.55)
2000	21.43	53.93	0.20	0.57	1.73	0.11	77.99
	(27.48)	(69.15)	(0.26)	(0.73)	(2.22)	(0.14)	(3.49)
2001	29.08	131.94	0.24	1.70	0.50	0.20	163.74
	(17.76)	(80.58)	(0.15)	(1.04)	(0.31)	(0.12)	(5.61)
2002	37.97	170.31	0.45	2.55	0.94	0.18	212.97
	(17.83)	(79.97)	(0.21)	(1.20)	(0.44)	(0.08)	(6.14)
2003	38.93	17.05	0.31	16.43	1.22	0.98	76.04
	(51.20)	(22.42)	(0.41)	(21.61)	(1.60)	(1.29)	(1.64)

Source: Centre for Monitoring Indian Economy, India Trades, Computerised database, Dec 2003.
Note: Figures in the parenthesis show share in total. Figures in the parenthesis given in the last column may be read as share of Electronics exports in total exports.

Table 8 India's IT import from ASEAN

(Us $ Million)

Year	**Singapore**	**Malaysia**	**Indonesia**	**Thailand**	**Philippines**	**Vietnam**	**Total IT**
1991	50.34	0.73	0.01	1.29	0.06	0.00	52.43
	(96.01)	(1.39)	(0.02)	(2.46)	(0.11)		(4.31)
1992	44.52	1.22	0.05	3.98	0.05	0.00	49.82
	(89.36)	(2.45)	(0.10)	(7.99)	(0.10)		(5.54)
1993	50.24	2.68	0.08	2.90	0.16	0.00	56.06
	(89.62)	(4.78)	(0.14)	(5.17)	(0.29)		(5.88)
1994	68.60	16.82	0.05	1.87	0.32	0.00	87.66
	(78.26)	(19.19)	(0.06)	(2.13)	(0.37)		(8.78)
1995	118.89	19.44	0.56	5.09	0.56	0.00	137.54
	(81.35)	(14.13)	(0.41)	(3.70)	(0.41)		(7.36)
1996	125.79	38.15	1.59	8.23	1.26	0.00	175.02
	(71.87)	(21.80)	(0.91)	(4.70)	(0.72)		(6.77)
1997	135.12	55.87	2.71	5.84	1.44	0.00	200.98
	(67.23)	(27.80)	(1.35)	(2.91)	(0.72)		(7.14)
1998	240.17	67.93	6.50	5.90	3.40	0.03	323.93
	(74.14)	(20.97)	(2.01)	(1.82)	(1.05)	(0.01)	(9.44)
1999	281.95	69.82	10.95	14.90	3.99	0.12	381.75
	(73.86)	(18.29)	(2.87)	(3.90)	(1.05)	(0.03)	(9.78)
2000	355.88	143.64	20.58	36.73	15.31	0.86	573.01
	(62.11)	(25.07)	(3.59)	(6.41)	(2.67)	(0.15)	(12.65)
2001	445.89	238.58	23.96	97.26	26.12	1.11	833.01
	(53.53)	(28.64)	(2.88)	(11.68)	(3.14)	(0.13)	(20.05)
2002	332.26	196.30	12.56	128.91	18.81	0.49	689.33
	(48.20)	(28.48)	(1.82)	(18.70)	(2.73)	(0.07)	(15.66)
2003	440.39	236.88	11.99	41.74	47.17	0.09	778.38
	(56.58)	(30.43)	(1.54)	(5.36)	(6.06)	(0.01)	(15.07)

Source: Centre for Monitoring Indian Economy, India Trades, Computerised databse, Dec 2003.
Note: Figures in the parenthesis show share in total. Figures in the parenthesis given in the last column may be read as share of Electronics exports in total exports.

There is the need for more detailed inquires to highlight the reasons for the inter-country variations. The trade relations in IT hardware appear to be more regionally balanced, here again the potential is yet to be reached.

Concluding observations

Great potential exists for India-ASEAN cooperation in information and communication technologies. While a promising beginning has already been made, there is a great need for hastening the cooperation. ASEAN can use India's emerging strength in IT software and IT-enabled services to strengthen and complement their own emerging capability in IT hardware. Although ASEAN countries are at various stages of economic development and their ICT capabilities are also at different levels, a common programme of action can be formulated to leverage each other's strengths and capabilities. If the experience during the last decade is any indication, the future appears to be more promising. However, there are significant inter-country variations and one could hypothesize that existing relationships are being forged at the instance of third country firms (MNCs) as part of their internationalized production process and global division of labour. Thus the benefits being accrued to either ASEAN or India may be less than what it appears to be the case. Given the fact that our understanding of the factors that stand in the way of greater integration between local firms is limited, there is an obvious need for more detailed inquiries. Yet, notwithstanding our limited knowledge base, we are tempted to infer that even with in the present environment there appears to be ample scope for further deepening the relationship between India and ASEAN if appropriate policy initiatives are made.

Based on the broad conclusions drawn from the paper, following suggestions may be made to foster a deeper integration between IT sector of India and ASEAN for mutual benefit. To begin with, there is the need to facilitate frequent meetings between the IT business community in India and ASEAN. Towards this end it may be worth considering the formation of IT business forums of business associations like NASSCOM in India with their counterparts and the Software and IT export Council of India and their counterparts in ASEAN countries. To facilitate the exploitation of synergies between the hardware capabilities of ASEAN and the software capabilities of India, projects involving joint research and production by private sector firms may be encouraged. If a revolving fund could be set up by India and ASEAN to encourge such joint initiative the return from such an investment could be substantial. In the context of growing demand for IT manpower, India might consider setting up a few DoE

accredited IT training centers in the CLMV countries. As the Old ASEAN are also not much better off with IT manpower especially in terms of quality and quantity it is worth exploring the possibility of integration between the universities in ASEAN-6 and that of India for mutual recognition of degrees exchange of scholars. Given the fact that as of now "English language capability" is a limiting factor in some of the ASEAN countries, India could contribute substantially in this regard. India should enhance the number of fellowships for ASEAN students to pursue IT education in India, especially for students from ASEAN-4.

Given the fact that various IT projects initiated in India for addressing poverty reduction and rural development are of considerable relevance to the CLMV countries, their IT ministers, high officials and other stakeholders like civil society organizations are to be given opportunities to expose themselves to various relevant IT projects and programmes being implemented in India. It might be arranged in line with the present Asian Ministers IT meet held each year. A key proposal that should be taken up seriously is minimizing restrictions on the mobility of IT manpower from India to all ASEAN countries.

Endnotes

1 See for details ASEAN vision 2020 available at http://www.aseansec.org/1814.htm

2 The other three are infrastructure, human resource development, and capacity building for regional economic integration. For details see, Initiative for ASEAN Integration (IAI): Work Plan For The CLMV Countries, available at http://www.aseansec.org/14680.htm

3 See for details, Framework Agreement On Comprehensive Economic Cooperation Between The Association Of Southeast Asian Nations And The Republic Of India, available at http://www.aseansec.org/15278.htm

4 Yet it may be noted that the relationship between ASEAN and other neighboring countries like Japan, South Korea and China is much closer as compared to that with India. More importantly, India's progress appears to be less illuminating when compared to the progress in China-ASEAN relationship. While India became a full dialogue partner (1995) earlier than China (1996), an agreement has already been reached in 2002 by China and ASEAN to establish a China–ASEAN Free Trade Area by 2012, where as, as per the agreement reached between India and ASEAN in Bali the FTA is to be established only by 2016. Thus China seems to be successful in developing a much stronger relationship with ASEAN as compared to India.

5 This has attracted the attention of researchers and there are a large number of studies focusing on the different aspects of ICT growth. An illustrative list includes (Heeks 1996, Kumar 2001, Joseph and Harilal 2001, Arora et.al 2001, Nath and Hazra 2002)

6 See, the three-part article on Indian IT industry by India's IT Minister Arun Shourie (2004a, 2004b, 2004c).

[7] Out of the top twenty software and service firms in India in 1998-99 only six were subsidiaries of foreign companies (Arrora and Athreya, 2002).

[8] See for instance Sen, Rahul, "India-Singapore CECA: A good start to an enduring economic relationship", http://www.iseas.edu.sg/viewpoint/rsmay03.pdf, and Sachdeva G and Wadhva. C "Indian Perspectives on East Asia", http://www.asiapacificresearch.ca/caprn/cisp_project/cisp_wadhva.pdf, and Mark Hong, "India-Singapore Relations: A Brief Overview", http://www.iseas.edu.sg/viewpoint/mhoct03.pdf

[9] Commenting on the development, D K Sareen, Executive Director of ESC said that his organisation would follow the strategy of collaborations and joint ventures to enter the Southeast Asian market.

[10] "Singapore at present has a Infocom resource pool of 93,000 which is significantly short of the projected demand. We, therefore, would like to outsource 25,000 professionals from India in the next five years to meet the demand", Singapore's Infocomm Development Authority (IDA) Chairman Lam Chuan Leong said in Delhi.

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Appendix Table 1: Top 20 Items of India's IT & Electronics Exports and the leading Importers (2001-02)

Items	Value $ Million)	Major Importing Countries
Computer Software & Service	7652.00	USA, UK, Germany, Japan, Singapore
Head Stacks	192.87	Malaysia, UK, Mauritius, USA, UAE
C.D. Recordable	92.24	Netherlands, USA, Germany, Australia, Korea
UPS	55.77	Netherlands, USA, Japan, Finland, Singapore
Other Medical Instruments	42.35	Russia, Japan, Thailand, Malaysia, Bangladesh
Floppy Disc or Diskettes	31.03	Netherlands, Austrlia, USA
Colour TV	29.98	UAE, Singapore, Sri Lanka, UK, Spain
Connectors	25.16	Germany, Netherlands, USA, UK, France
P.A. System	17.82	UAE, Nigeria, UK, Italy, Germany
Colour Picture Tube	17.62	Turkey, Solvenia, Egypt, South Africa, Spain
Ferrites	15.93	France, Germany, USA, Taiwan, UK
Solar Cells Photovolatic Cell	15.72	Germany, Bangladesh, UK, Bhutan, Sri Lanka
Memory Card	14.88	UK, UAE, USA, Australia. Singapore, Malaysia, Hong Kong, Sri Lanka
Unpopulated PCB	14.47	Austria, Malaysia, Germany, USA, Netherlands
Clocks	13.84	UAE, Nigeria, Saudi Arabia, USA, Kenya
Transformers	12.58	Finland, France, Hong Kong, USA, Malaysia
Writing Harness	11.53	Germany, USA, Netherlands, Malaysia, Hungry
Watches	11.32	UAE, Hong Kong, Oman, UK, Saudi Arabia
Linear Ultrasound Scanner	11.11	Thailand, Malaysia, Korea, Japan
Electronic Components N.E.S.	10.27	USA, UK, Japan, Austria, Germany, Belgium, Hong Kong, Taiwan

Source: Electronics and Computer Software Export Promotion Council (2002), *Statistical Yearbook of Indian IT and Electronics Industry, 2002*. ESC, New Delhi**.**

Appendix table 2: Top 10 export Items of Computer Hardware During 2001-02 and 2000-01 and the Importing Countries

($ Million)

Items	2001-2002	2000-2001	Top Destinations
Head Stacks	192.92	176.38	**Malaysia** (46.11) UK (37.61) Mauritius (10.96) USA (1.82) UAE (1.42) Others (2.08)
Switching Mode Power Supply	4.32	3.37	USA (43.26) **Singapore (42.8)** Portugal (7.91) Bangaldesh (1.88) Thailand (1.1) Others (3.05)
Scanner	3.84	3.87	USA (60.00) UK (40.00)
Personal Computer (Laptop, Palmtop Etc.) Or Micro Computer/Processor	3.22	5.72	**Malaysia (30.53)** USA (23.93) UK (8.86) Bosnia-Herzegovina (8.34) Singapore (8.02) Others (20.32)
Add On Cards	1.87	0.27	USA (43.16) France (34.28) **Singapore (6.95)** Sweden (4.24) UK (2.7) Others (8.67)
Dot Matrix Printer	1.34	2.53	Company (90.99) South Africa (6.09) **Malaysia (2.44)** Israel (0.48)
LAN Cards	0.73	0.48	Bangladesh (30.81) Sri Lanka (29.66) UAE (19.22) USA (8.92) Maldives (4.88) Others (6.51)
CGA Monitor	0.46	0.03	Bangladesh (77.25) Sri Lanka (22.75)
Other Automatic Data Processing Machines	0.09	0.13	Australia (60.00) Singapore (40.00)
Parts of Printer	0.02	0.02	Germany (96.00) Sri Lanka (4.00)

Source: Electronics and Computer Software Export Promotion Council (2002), *Statistical Yearbook of Indian IT and Electronics Industry, 2002*. ESC, New Delhi.

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