SOFTWARE AND IT ENABLED SERVICES INDUSTRY IN KERALA

- AN ANALYSIS OF PROBLEMS AND PROSPECTS

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I, hereby affirm that the work for the dissertation '***Software and IT Enabled Services in Kerala – an analysis of Problems and Prospects***', being submitted as part of the requirements of the M Phil Programme in Applied Economics of the Jawaharlal Nehru University, was carried out entirely by myself and has not formed part of any other Programme and not submitted to any other institution/University for the award of Degree or Programme of Study.

June 28, 2002

G. R. Kiran

Certified that this study is the bona fide work of G. R. Kiran, carried out under our supervision at the Centre for Development Studies.

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To my Guru

Navajyothi Sree Karunakara Guru

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ABSTRACT OF THE DISSERTATION
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Of the many technologies of our time, the progress made in Information and Communication Technology (ICT) is believed to be a revolution with profound influence on economic development. The developed countries are already in the process of taking advantage of the revolution. The developing countries, as well, are showing keen interest in evolving policies and allocating the highest priority for investment of their scarce resources for the development and diffusion of ICT. These countries believe that ICT can provide them a short cut to prosperity by allowing them to bypass some phases of development in the conventional stages of structural transformation from agrarian to industrial and ultimately to knowledge-based service sector.

India is one among the bandwagon of those developing countries. India has already crossed a few milestones in the development of the software export segment of the ICT industry. Within the country, there is a fierce competitive race among the states to attract ICT industry into that region, especially its software and service segments, with a view to utilise the opportunity for the larger economic development of the region.

It is, however, seen that there is a need to have a few prerequisites to succeed in leapfrogging using ICT. These include absorptive capacities to produce and use ICT, access to equipment and know-how to make productive use of latest ICT, complementary technological capabilities and downstream integration capabilities. Further, the ability of ICT to reduce poverty and spur development will be determined by its impact on employment, as well as how the economic growth that results from ICT translates into the creation of productive and remunerative work. All this would mean that a developing country (or one of its developing region), which has a pool of skilled human resources has an ideal condition for technological leapfrogging.

The experience of Kerala is taken as a case study. Kerala is a state-region with relative abundance of educated and skilled human resource, but so far without achieving relatively higher levels of economic development. The state-government has recently opted for a development strategy that gives high priority to the development and diffusion of ICT with the participation of the private sector. Though, Kerala, apparently, seems to have the necessary prerequisites to utilise ICT for attaining its larger economic objectives, in reality, the state does not seem to have really utilised the opportunity, especially in the software industry side.

Given this situation, the present study explores the problems and prospects of the software industry in the state with special emphasis on understanding the regional limiting factors or constraints which might have a bearing on the structure, labour force and firm's strategies, all of which, perhaps, have some relationship with the state policy as well.

The study is based on both primary and secondary data. The approach adopted employed was to undertake a primary survey of the software firms based on a primary survey using structured questionnaire and to then undertake a detailed probing of the major issues that

rose, through the case study method. Secondary data was collected to draw a profile of the Indian software industry.

The emergence of a developing country like India as a significant player in the software market has attracted a lot of attention from development literature. The growth of exports of software from India at over 50% compound annual rate over the past decade has led policy makers within the country to view it as an engine of growth, a source of employment and foreign exchange, among other favourable effects. The emerging trends in the Indian software industry shows that the there is a conscious move away from low value adding coding and programming to export of high end consulting and packaged software, indicating that the industry has come of age and is ready to play a dominant role in the global software market.

The Kerala software industry is characterised by its small size, in terms of capital investment and employment. While, the relatively larger firms are able to make appropriate marketing arrangements with their clients abroad, the smaller firms find it extremely difficult to operate in the market. Their worries are further increased by the fact that the domestic demand is low and that the e-governance projects by the government are almost always given to the public sector firms.

While the state has an advantage with respect to the human resource availability, the quality of the available manpower is far from desirable. This could soon act as a major constraint for further development of the industry in the state. The state also has a disadvantage in terms of the non-availability of metropolitan social infrastructure, which is critical for the industry to retain their human resources. Moreover, the state also lacks associated infrastructure including convenient and frequent international and national flight connectivity, centres of technical and management excellence, etc. which are considered vital by the industry.

These physical realities coupled with the negative labour related perceptions of the state have been instrumental in limiting the agglomeration of software industries in the state. It may specifically be noted here that this situation is, in spite of the earlier interventions taken by the state in the sector including the creation of Keltron, Technopark, investment policy, etc.

The study shows that a region like Kerala has a lot to benefit out of the opportunities provided by ICT, both from its supply side as well as its demand side. However, apart from having certain initial endowments, the region also needs to create necessary capacity and capabilities for succeeding in utilising the potential of ICT. Moreover, it also has to identify suitable areas of operation in the supply side, based on the strengths of the region. The study brings out the fact that the state has reasonably good prospects to emerge as a leading ITES hub in the country. It may, however, be noted that the state needs to intervene directly and indirectly, especially during the initial stages, to induce the cumulative process of agglomeration of such firms.

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Introduction: Objectives, Scope and Methodology

1.1. Introduction

Technology is considered as an important source of economic growth. This idea, which had its early definite conclusions followed from the neoclassical growth model of Solow (1957), was further established through a stream of studies by Arrow (1962), Mansfield (1968), Griliches (1957), Scherer (1980) and many others. Recent empirical analyses[1] document how the key features pertaining to the pattern of cross-country development hinge on technology. Of the many technologies of our time, the progress made in Information and Communication Technology (ICT) is believed to be a revolution with profound influence on economic development. The rapid advancement taking place in ICT is making it economically feasible to collect, store, process and transmit information at breathtaking speed, reduce cost, particularly, the transaction cost, raise productivity and increase economic welfare. While the nature of some of these advantages are debated, there is a popular feeling that this new technology is an example of the third industrial revolution taking place in the world economy.

The developed countries are already in the process of taking advantage of the revolution. The developing countries, as well, are showing keen interest in evolving policies and allocating the highest priority for investment of their scarce resources for the development and diffusion of ICT. These countries believe that ICT can provide them a short cut to prosperity by allowing them to bypass some phases of development in the conventional stages of structural transformation from agrarian to industrial and ultimately to knowledge-based[2] service sector.

India is one among the bandwagon of those developing countries. India has already crossed a few milestones in the development of the software export segment of the ICT industry. Within the country, there is a fierce competitive race among the states to attract ICT industry into that region, especially its software and service segments, with a view

[1] See Feyrer (2001).
[2] See Stiglitz (1995, 1998), Paul and Dominique (2002).

to utilise the opportunity for the larger economic development of the region. However, the industry is getting established only in a few states and Kerala happens to be one among them. While the industry is growing substantially fast in these states, there are very few analytical studies on the processes and constraints in the development of ICT and the effects on the region's economy. The present study is an attempt to portray the profile of growth, characteristics and constraints of the software and service segments of ICT in Kerala state. The study is undertaken with the hope that a case study of Kerala experience will enhance our understanding of the scope and limitations of ICT as a tool for accelerated economic development, especially in the context of state-regions in a federal country. This chapter introduces the objectives, scope, and methodology of the study.

1.2. ICT and Economic Development.

There are three major ways in which economic and welfare gains result from ICT[3]: (i) participating in the production and trade of the growing world demand for ICT products (both hardware and software) and services, (ii) increasing efficiency and productivity by greater use (diffusion) of ICT in the different sectors of the economy, and (iii) availing the avenues that the networking opens up for helping the weaker sections of the society from poverty, deprivation and inequity and, thereby improving the quality of life.

Moreover, since knowledge is the primary input in the ICT industry, it opens up new and feasible opportunities for the development and diffusion of ICT by capital-scarce developing countries and their relatively less developed regions. This is particularly true in the software and service segments of ICT industry.

The possibility of ICT-driven economic development in the world is fuelled by the fact that it offers lower-income countries the chance to "leapfrog" stages of traditional development through technological advancements. ICT makes access to information more symmetrical and can hence play a vital role in bridging the development gaps.

[3] ICT refer to the systems created by the combination of computer and communication technologies (hardware, software and services). It is a convergence of a number of inter-related advances in the field of microelectronics, fibre optics, software engineering, communication, laser and computer technology. This study uses the expression 'ICT' to indicate both a new range of products and services as well as a new technology.

More people can have access to more information whenever and wherever they need it and this can disrupt the traditionally established economic relations. This could also have profound changes in the structure of markets, organizations, institutions and established patterns of economic behaviour.

Another characteristic feature of ICT lies in the fact that it is a pervasive technology having impacts on all sectors of an economy and is hence considered as a key force for economic development[4] by both developed and developing countries (ADBI, 2001). The rapid dissemination of information, the substitution of digital medium for paper record keeping, and the networking capabilities of the Internet are all believed to improve flexibility and responsiveness, encourage new and more efficient intermediaries, increase the use of outsourcing, reduce time to market by linking orders to production, and improve internal coordination (World Bank, 2000).

Most industrialised and newly industrialising countries use ICT in areas as diverse as governance, education, healthcare, manufacturing, banking and finance, transportation, commerce, publishing, energy conservation and environment management. An increasing number of developing countries are in the race for strengthening market forces for utilising both the supply side (production) as well as the demand side (diffusion) opportunities of ICT to exploit its potential for their economic development.

1.2.1. Production of ICT goods and services

Production of ICT goods and services has contributed quite substantially to economic growth in many developed and newly industrialised countries. The average share of ICT goods in manufacturing value added was 7.2 percent in the OECD countries in 1993. The shares were highest in Japan and in the Netherlands, 10.5 and 10.6 percent, respectively (OECD, 1999). Wong (2001) estimates that ICT goods accounted for 44 percent of the manufacturing value added in Singapore in 1994. Electronics production has certainly played an important role in the development process of all the newly industrialized countries. In 1996, Hong Kong, Singapore, South Korea and Taiwan

[4] A study conducted by US Department of Commerce in 1998 revealed that ICT contributed 35 percent to the real economic growth in that country between 1995 and 1998. It was also estimated that one half of their workforce would be in the ICT industry by 2005.

jointly accounted for 12 percent and Indonesia, Malaysia and Thailand for 5 percent of the electronics industry production in the world.

But, as Kraemer and Dedrick (2000) and Jalava and Pahjola (2001) argue, recent research on the use of information technology and related research on computer production suggest that the benefits from usage of IT are likely to outweigh the benefits from production, which are limited to just one sector of the economy. They also argue that the ongoing globalization of production makes it difficult for developing countries to reap the benefits from the production of information technology. While a number of new countries (like Japan, Taiwan, Hong Kong, South Korea, China, India and the Philippines) successfully entered the IT industry during the PC revolution of the 1980s, the other countries such as Brazil and Mexico have had little success. Even Japan and South Korea have enjoyed only limited benefits from computer production, as opposed to component production, outside their own markets.

1.2.2. ICT product segments and world markets

In 1996, the world information technology market (including computer hardware, data communications equipment, computer software and computer services) was worth an estimated US$ 528 billion as measured by the revenues of primary vendors (OECD 1999). This is about 8 percent of the US gross domestic product. The market grew at an annual rate of 14 percent between 1986 and 1996. This was about twice the growth rate of gross domestic product worldwide.

The distribution of the IT market by geographic area and by main market segment is shown below in table 1.1. The market is remarkably concentrated with North America, Western Europe and Asia Pacific accounting for 96 percent. In 1996 the two dominating countries were the United States with 41 % and Japan with 17 % share of the world market. The growth rate was the highest in Asia Pacific amounting to 19 percent per year in 1986-96.

In 1996, for the first time, over one half of the worldwide revenues of IT producers came from packaged software and computer services. The shift in the structure of the market

is mainly due to the increasing importance of packaged software and the declining significance of multi-user hardware (i.e., mainframes and minicomputers).

Table 1.1 Worldwide information technology market break up, 1996

	Market share (%)	Compound annual growth rate 1986-96 (%)
By geographic area		
North America	43.5	9.4
Latin America	2.0	15.6
Western Europe	28.3	15.6
E. Europe, Middle East, Africa	2.6	10.6
Asia Pacific	23.7	18.9
	100	
By main segment		
PCs and workstations	30.5	17.2
Multi-user systems	13.0	4.0
Data communication equipment	4.3	17.0
Packaged software	18.4	16.3
Services	33.7	13.0
	100.0	

Data source: World Bank (1999)

The size of the ICT market seems to correlate positively with the standard of living as measured by GDP per capita in purchasing power parities. The share exceeds 3 percent in the United Kingdom, Canada, Sweden and the United States, whereas it is only about half a percent in Romania, Egypt, Turkey, Indonesia and India. The worldwide ICT market is about twice as large as the information technology (IT) market alone. In 1995 it was estimated at US$ 1,400 billion. Telecommunications services account for 43 percent and telecommunications equipment for 8 percent of the revenues.

1.2.3. Diffusion of ICT

Another aspect that has received attention in the literature is diffusion. ICT diffusion involves more than acquiring computerised equipment and related know-how. It involves

the development of technical change generating capabilities, to adapt given technology to a widening range of needs (Hanna, et al. 1995). Continuous improvement after acquisition is essential to sustain competitiveness[5]. A number of barriers appear to impede the diffusion of ICT, in both developing countries and developed countries. One of the major constraints, even in OECD countries, is the lack of awareness about the potential of ICT.

The ICT spending in developing economies has been growing more than twice as fast as in developed countries over the past decade, though admittedly from a very low base (Wong 2001). If the share of spending on ICT in a country's GDP is considered as a proxy of the level of diffusion, it can be shown that the use of ICT has been growing fast in developing countries. This is clear from table 1.2.

The average share of IT spending in nominal GDP was 1.4 percent in these countries in 1991 and 2.0 percent in 1996. GDP grew at the rate of 6.7 percent on average, whereas IT spending increased at the rate of 15.0 percent from 1991 to 1996. The relative contribution of IT to GDP growth was less than 2 percent in Argentina, Brazil, Chile, China, India, Spain, Thailand and Venezuela, but larger than 10 percent in Canada, Finland, South Africa, Sweden, UK and USA.

New technologies require an incubation period before they build a user base quickly, and often have little impact on growth rates and output for some time (Rogers, 1995). They might require additional training of the workforce, reorganization of the production process or company structure, replacement of obsolete machinery and so on. After this period, which can be very long, productivity and growth could increase. In addition to the direct impact of the technology, there are often indirect spillovers into other industries. In the final stage, the technology will be fully exploited and growth will slow down again. (Chong and Zanforlin, 1999).

[5] The reality of diffusion of new technologies is different from the neoclassical view of technology transfer, which assumes that technology is readily transferable between different agents, and that such transfer can be readily effected through the market.

Table 1.2. Nominal gross domestic product and spending on information technology

Country	Share of IT spending in GDP, %		Compound average annual growth rate, %			Relative contribution of IT spending to GDP change, %
	1991	1996	GDP	IT spending	IT share	
Argentina	0.3	0.7	8.8	26.1	17.3	1.4
Australia	1.9	2.6	5.3	12.3	7.0	5.2
Austria	1.4	1.9	6.1	11.9	5.8	3.2
Belgium	1.9	2.2	5.7	8.6	2.9	3.0
Brazil	0.8	1.2	13.2	21.2	8.0	1.6
Canada	1.4	3.2	-0.2	15.7	15.8	-211.2
Chile	0.8	1.1	15.4	21.4	6.0	1.3
China	0.5	1.0	15.4	29.3	13.9	1.4
Denmark	2.3	2.8	5.9	10.2	4.2	4.3
Finland	1.7	2.5	0.4	7.5	7.0	36.7
France	1.8	2.2	5.0	9.1	4.1	3.7
Germany	1.6	1.9	6.3	9.6	3.4	2.7
Hong Kong	0.7	1.3	11.7	24.2	12.4	2.1
Hungary	1.5	1.9	5.9	11.3	5.4	3.3
India	0.3	0.6	6.9	24.3	17.4	1.5
Italy	1.2	1.4	1.0	3.8	2.8	5.0
Japan	1.8	2.2	6.0	9.7	3.7	3.3
Korea, Rep of	0.7	2.3	10.0	33.6	23.6	4.7
Malaysia	0.9	1.8	14.9	29.8	14.8	2.7
Mexico	0.6	0.9	1.3	8.5	7.2	5.0
Netherlands	2.2	2.6	6.0	8.9	2.8	3.5
New Zealand	2.2	2.9	8.9	14.6	5.7	4.1
Norway	1.9	2.4	5.9	10.1	4.3	3.8
Singapore	14	2.6	15.4	27.3	11.9	3.6
South Africa	1.8	2.7	2.3	11.1	8.7	10.5
Spain	1.2	1.2	1.9	2.4	0.5	1.5
Sweden	2.2	3.2	0.9	8.2	7.3	24.8
Switzerland	2.4	2.9	4.6	8.2	3.5	4.6
Thailand	0.5	1.0	12.7	26.2	13.5	1.6
UK	1.9	3.1	2.5	12.1	9.6	12.1
USA	2.1	3.9	5.0	17.3	12.3	10.0
Venezuela	1.0	1.1	4.6	5.8	1.2	1.3
Average	1.4	2.0	6.7	15.0	8.3	

Data source: World Bank (1999)

The differences between the industrial and developing countries in the penetration of communications equipment are shown in Table 1.3. The ICT diffusion gap is present not only for computers but also for telephones, televisions and radios. Developing countries have about 185 radios per 1000 people, a fifth of the ratio in industrial countries, and 145 televisions per 1000 people, a little more than a fourth of that in industrial countries. The industrial countries have 414 main telephone line per 1000 people, which is more than 10 times the ratio in developing countries.

Table 1.3. World communication profile, 1995
(Communication equipment per 1000 people)

	North America	Nordic countries	European Union	Industrial Countries	Developing countries
Radios	1990	928	880	1005	185
Televisions	763	514	522	524	145
Main telephone lines	622	614	486	414	39
Cellular telephone	124	205	58	61	4
Internet users	38	70	17	18	1
Personal computers	315	222	138	156	7

Data Source: UNDP (1998)

There are large differences in the penetration of communication equipment even between industrial countries. While North America leads in the number of televisions, radio and main telephone line per capita, the Nordic countries are on the top of the list when cellular mobile telephone subscribers and Internet users are considered. These countries also fare much better than the European Union in the penetration of personal computers.

1.2.4. Review of literature

Much of the studies on ICT in the economic literature are on its role in the "new economy". There has not been many attempts either to understand the process of its working, the consequent problems and their impact in different typologies of economy and society. The central focus of most of the impact studies has been limited to the relationship between ICT and productivity and that too in the industrialised countries.

In the 1980s, many studies tried to assess the impact of Information Technology (IT), especially computerisation, on the productivity of business organisations as well as the macro economy of the developed countries, especially USA. The studies revealed a mixed picture, with only a few ones indicating productivity increase. The productivity paradox was a major issue of debate during the 1980s and early 1990s. Robert M. Solow's famous 1987 saying that "we can see the computer age everywhere but in the productivity statistics" best captures the feeling during this period[6]. Oliner and Sichel (1994) found that the productivity associated with ICT was low and that the reason stemmed from the fact that ICT equipment represented an extremely small fraction of the total capital stock.

For a decade, economists continued to note the co-existence of explosive growth in computer use and dismal growth in labour productivity, and they differed probably only in their explanations[7]. But by 1999-2000 a consensus emerged that the technological revolution represented by the new economy was responsible directly or indirectly, not just for the productivity growth acceleration, but also for the stock market and wealth boom and spreading of benefits to the lower half of the income distribution. In short, Solow's paradox argument seemed obsolete and its inventor admitted as much[8].

However, the evidence of productivity increase is much weaker outside the USA. The principal problem in analysing the impacts of ICT is that, except in the USA, national income and product accounts do not provide detailed enough information about ICT investment, quality adjusted price indices and measures of ICT capital stocks (Jalava, J and Pahjola, M, 2001).

ICT is both an output from the ICT producing industries and an input into the ICT using industries and hence it can enhance economic growth in many ways. The production of ICT goods and services and the use of ICT as an input in the production of other goods and services, contributes directly to the total value added in an economy[9]. It has been

[6] See Solow (1987)
[7] The explanations included "the computers are not everywhere," or "there must be something wrong with the productivity statistics," or "there must be something wrong with the computers." The best compendium and assessments of these and other alternative explanations is provided by Triplett (1999).
[8] Solow is quoted as such in Uchitelle (2000).
[9] The estimates of OECD (2000) show that ICT goods and services typically constitute between 3 and 5 percent of total GDP.

shown that nearly one half of the recent labour productivity pick-up in the United States is due to the increased use of ICT (Oliner and Sichel, 2000).

ICT can also enhance economic growth through its impact on multi-factor productivity. Gordon (2000) argues that improvements in the production of computer hardware account for the entire acceleration in the labour productivity that has occurred in the US since the mid 1990s. However, Oliner and Sichel (2000) point out that about 25% of the labour productivity increase is due to multifactor productivity improvements in the ICT industry.

Jorgenson and Stiroh (2000) analysed a broad set of 37 industries and came up with estimates that are similar to that of Oliner and Sichel. They, however, find little evidence of spillovers from production of ICT to the industries using ICT intensively, such as finance, insurance, real estate and other services. They feel that this may possibly be due to difficulty in measurement in many service activities or that ICT is not productive in some industries. According to Gordon (2000) the impact of ICT on labour productivity in USA is somewhat more pessimistic than most other studies of the period. He points out that the productivity impact of ICT investments has been limited to the computer and other durable goods manufacturing sector.

Schreyer (2000) has tapped the International Data Corporation (IDC) data source for current price expenditures on ICT goods (software excluded) in the G7 countries. He has estimated that in 1990-96, the ICT contribution to GDP growth was roughly 0.2 percentage points a year in France, West Germany, Italy and Japan, 0.3 percentage points in Canada and UK and 0.4 percentage points in the USA. The OECD (2001) study reveals that output contributions in the late 1990s have increased only in USA, Finland and Australia. The fact that Australia is not a significant producer of ICT also gives evidence to the fact that ICT production is not a necessary condition to experience the growth effects of ICT.

Jalava and Pahjola (2001) studied the role of ICT in the Finnish economy. In 1999, the Finnish nominal GDP was 6.8 times as large as in 1975, but the nominal gross value added of ICT industries was 21 times as large as it was in 1975. The contribution from the use of ICT to output growth has increased from 0.3 percentage points in the early

1990s to 0.7 points in the late 1990s. Moreover, the fast growth of multi-factor productivity in the ICT producing industries has also had a substantial growth contribution.

Not many scholarly studies seem to have been attempted regarding the impact of ICT on the overall productivity of the economy in the context of developing countries. However, impact of ICT on certain specific sectors has been undertaken (e.g. export oriented garment industry in India by Lal, K., 1999). Studies on the impact of ICT on the productivity at macro level are conspicuous for its absence. May be that ICT diffusion in most developing countries is so low that its impact on the economy in terms of productivity enhancements is also expected to be low. Moreover, the benefits from ICT investments may not be immediately observable in all cases. It is noted that several years passed before such evidence became available in the United States following investments in ICT in the 1980s. Hence a sound analysis of present productivity measures for taking future ICT investment decisions are often difficult (UNDP, 2000).

The promise of ICT in addressing manufacturing productivity in developing nations is that, improved productivity advances would allow a substantial expansion of industrial output. Such output expansion, if large enough, could have profound influence on the creation of employment and wealth. Because ICT is often labour-saving, a large increase in output is necessary to raise the derived demand for labour, net of the labour released through productivity improvement. Otherwise, the impact of ICT will be to reduce labour-inputs, which is an undesirable outcome if there are no satisfactory alternative employment alternatives. This is common in developing nations (ILO, 2001).

1.3. Digital divide

There is a growing fear that the growth of ICT will follow existing lines of social and economic inequality and possibly even intensify prevalent patterns of social exclusion unless public policies are framed to counter these issues (ILO, 2001). With about 1.2 billion, or over 20 percent of the world's population living in absolute poverty at less than US $1 a day, doubts are raised as to whether the capabilities of ICT can really be harnessed to reduce poverty and generate more equitable growth. While acknowledging that the rapid development of ICT represents a revolution in the making, the World

Employment Report 2001 points out that disparities in the diffusion and use of these new technologies risk widening the already serious 'digital divide', between technological haves and have-nots. In fact, nearly all the world's ICT is produced by approximately 15 percent of the population, living mostly in industrialised countries. Only about one-half the world's population even has access to electricity, phone lines and other infrastructure necessary to enable them to adapt these technologies in production and consumption (HDR, 2001).

The extent of the digital divide is further illustrated by the fact that while 70 percent of the European Union (EU) labour force is engaged in technology-intensive work, more than half the world's population is yet to place a telephone call (ILO, 2001). In many countries, the determining factor for ICT access is a telephone line. However, telephone lines are comparatively scarce and heavily concentrated amongst the wealthier countries or the wealthiest sectors of the population of poorer countries. About one phone exists for every two persons in the US and the EU, whereas Africa's entire population of 739 million people has fewer than 14 million telephones (HDR, 2001).

Although computer usage and internet access are growing spectacularly in many parts of the world, it remains the case that only little more than 5 percent of the world's population are internet users and that 88 percent of these are in the industrialised countries (ILO, 2001). While two countries, USA and Canada, alone account for 57 percent of the world's Internet users, all the countries in Africa and the Middle East together account for only one percent. It is estimated that approximately 75 percent of all Internet information is produced in just one language: English (www.internetindicators.com).

1.4. Spatial agglomeration of software industry

There is another important aspect of digital divide and economic development about which our analytical understanding is very limited. This is concerned with the development of regions within a country. In particular, regional disparities in development and consequent inter-regional inequality in income and levels of living across state-regions in developing countries constitute a complex problem in economic development.

Large regional disparities represent serious threats in federal states, as the inability of the state to deal with such inequities creates potential for disunity and even disintegration. It is alarming to note that most of the studies[10] have shown that regional inequality within India has increased over the last few decades. There are a number of reasons[11] cited for the increasing regional inequality in the country. It is also being pointed out that globalisation could heighten these challenges, as it places a premium on skills. Skilled workers gain at the expense of unskilled ones. As typically rich regions also have better educated and better skilled labour, the gulf between the rich and the poor regions could further widen.

To some extent, the differential resource endowment lead to spatial concentration of industrial location and give rise to regional differentiation. However, ICT products, being foot-lose in nature, can be located at any point in space. Thus viewed, the promotion of ICT industries and services in an economically backward state-region can be used as a strategy to create employment opportunities and increase income levels and thereby help achieve the objective of reduced spatial inequalities and more balanced regional development.

However, it is observed that the software industry in India is located mainly around a few major cities. The larger question, then, is whether a new region like Kerala, which has not been a major software player, can ever emerge as a leading software producer in the country. An analysis of the regional problems and prospects for software industries cannot be undertaken without investigating the reasons for location and spatial agglomeration of the software industry.

While there does not seem to be many scholarly attempts to study this aspect of the software industry, the work of Haug (1991) has shown that five main factors play a part in the locational decisions of software companies. They include labour availability, quality of life, infrastructure, proximity to previous employer and residence and proximity to customers. A generalisation based on these factors is difficult since cities in

[10] See Bajpai and Sachs (1996), Cashin and Sahay(1996), Das and Barua(1996), Nagaraj, et al (2000), Rao, et al (1999) and Yagci(1999).

[11] One explanation is that India is still in an early stage of development and therefore is on the wrong side of the 'inverted U' pattern of regional inequalities (Williamson, 1965). Another reason cited is the relatively high barrier to interstate trade in India. Yet another major reason cited is the perverse nature of the central government's regional development policies and the inter-governmental transfer system.

Kerala might rank better than a few of the present established software locations in the country.

Many theoretical frameworks, like the location theory, study the centripetal and centrifugal forces that govern the creation of spatial agglomeration of industries. The literature on industrial localization is extensive and includes Hoover, 1948; Lichtenberg 1960 and Porter, 1990. It was however Alfred Marshall who had presented the classic economic analysis of the phenomenon.

Marshall (1920) identified three distinct reasons for localization. First, by concentrating a number of firms in an industry in the same place, an industrial centre allows a pooled market for workers with specialised skills, the pooled market benefiting both workers and firms. Second, an industrial centre allows provision of non-traded inputs specific to an industry in greater variety and at lower cost. Finally, because information flows locally more easily than greater distances, an industrial centre generates technological spillovers.

The labour–market-pooling theory of localisation seems to best describe the spatial agglomeration of software industries. It may be noted that this theory gives more importance to the critical aspect of labour than the transportation cost, which is considered as important in all other conventional theories of location.

Krugman (1991) extends the concept and strongly points out as to why pooling of a market for specialized labour is beneficial. His idea can be effectively portrayed through a model (See Annexure 1) with an underlying assumption that labour market always clears.

The model seems to explain the underlying process of a knowledge-based industry to spatially cluster in certain locations. Krugman (1991) points out that small accidental events start a cumulative process in which the presence of a large number of firms and workers acts as an incentive for still more firms and workers to congregate at a particular location. The resulting pattern may, however, be determined by underlying resources and technology at some very aggregate level.

Software industry is characterised by rapid technological and market changes. This provides a new region with opportunities to start specific activities in a niche, where the region has got a comparative advantage. This could lead to a situation where more firms and workers in this category or sub sector of software industry pooling in this location.

Are there sufficient empirical evidence to support above propositions and in particular, whether a backward region, with low industrial background, has the competitiveness for the development and diffusion of even software and service segments and whether that process would help raise overall development of the region's economy? What are the major constraints and problems for promoting ICT industries? If there are market-failures, what is the role that the region's government has to play? These are important issues to be addressed in the context of using ICT as a tool of regional economic development.

Here, it is also instructive to point out that there are a few prerequisites to succeed in leapfrogging the process of development and diffusion of ICT (Steinmueller, 2001) These include absorptive capacities to produce and use ICT, access to equipment and know-how to make productive use of latest ICT, complementary technological capabilities and downstream integration capabilities. Further, the ability of ICT to reduce poverty and spur development will be determined by its impact on employment, as well as how the economic growth that results from ICT translates into the creation of productive and remunerative work (ILO, 2001). All this would mean that a developing country (or one of its developing region), which has a pool of skilled human resources and thus one of the ideal conditions for technological leapfrogging, has to comprehend the complex economic and social issues associated with ICT before trying to tap the potential of this new technology for their economic development.

While the importance of ICT in raising economic growth and standard of living is recognised in economics, there are not many studies that have gone into the dynamics of its development and diffusion in detail, especially in a developing country context. The available studies in economics discipline are mostly related to developed or newly industrialising countries and that too mainly on the impact of ICT on productivity.

The present study makes an attempt to review and understand the process of development of software based industry and IT enabled industry segments (henceforth Software[12] industry) of ICT industry in a regional economy. For this purpose the experience of Kerala is taken as a case study. Kerala is a state-region with relative abundance of educated and skilled human resource, but so far without achieving relatively higher levels of economic development. Therefore, the state-government has recently opted for a development strategy that gives high priority to the development and diffusion of ICT with the participation of the private sector.

A review of the development of ICT industry especially, its software and service segments, in Kerala is not only interesting but also timely. In order to specify the basic objectives, hypothesis, and methodology of the study, it may be useful to attempt a quick review of some of the major issues pertaining to ICT in developing countries.

1.5. ICT in Developing countries

Developing countries have shown keen interest in and are placing high hopes on the modern ICT (UNDP, 1997; World Bank, 1999). As has been pointed out, a knowledge-based economy requires an economic and institutional regime that provides incentives for the efficient use of existing knowledge, for the creation or adaptation of knowledge, and for the dismantling of obsolete activities and the start-up of more efficient new ones (World Bank, 2000). An educated and entrepreneurial workforce that can use new knowledge efficiently and effectively is also needed.

The potential benefits from ICT development for developing countries are many. The most important ones include new export opportunities, new business opportunities such as ICT enabled services, provision of information and technical assistance to farmers on markets, weather and crop management, new educational opportunities to the general

[12] Software industry as used here comprises of the high value adding IT Software as well as the low value adding IT enabled services (ITES). *IT Software* is defined as any representation of instruction, data, sound, image including source code, object code recorded in a machine, readable form and capable of being manipulated or providing interactivity to use by means of automatic data processing machines. IT Software includes Operating System, Application Software, Middleware, and Firmware. *IT Enabled Service* is defined as any product or service that is provided or delivered using the resources of Information and Communication Technology. ITES include data entry, transcriptions, call centres, etc. Unless otherwise stated, the term software activity referred in the thesis refers to the first category and software services to the second category.

population at large, provision of primary health advice, training and basic education in rural and remote areas, opportunities to enhance the quality of government services by improving accountability and transparency, empowerment and participation of all stakeholders including the poor.

In particular, ICT can bring about a more seamless integration of the global labour markets than what was considered possible before. This integration is likely to be facilitated by the confluence of a number of factors such as the dwindling trade barriers from multilateral trade negotiations and rapid dissemination of market information, efficient allocation of labour, as well as the efficient delivery of services (ADBI, 2001). Hence, developing countries need to take care of the large and growing divide in terms of access to and the use of ICT called "the digital divide" among developed and developing countries, and within countries.

The point of emphasis in the literature is this: although ICT can help developing countries to leapfrog some technological barriers, it is not a panacea for development problems or a substitute for sound economic policies. It can contribute to development only insofar as it forms a part of an overall development strategy for creating a sound policy environment for sustainable economic growth and development (ADBI, 2001).

Considering the prospect that most of the world's people are unlikely to reap the advantages that the use of the new technologies will bring any time soon through market intervention and also considering the characteristics of the technology like free rider problem and externalities, it is strongly argued that the markets alone will not be able, rather allowed, to dictate the course of the ICT, especially in developing countries (Hanna, N. et al, 1995; Subrahmanian, K. K., 1999; ILO 2001).

1.6. ICT, Employment and Labour Market

The digital convergence of information and communication technologies (ICT) has lessened two long-standing obstacles to communication namely, delay and distance. This is transforming not just the transaction processes but is also effecting changes in the world of work as well.

The creation and loss of jobs, the content and quality of work, the location of work, the nature of the employment contract, the skills required and how often they can be obtained, the organization of work and the functioning and effectiveness of worker and employer organizations are all affected by the emerging era of digital globalisation (ILO, 2001). The ICT revolution presents an unusually vast mix of risks and opportunities extending to every area in the world of work.

Knowledge workers, those who generate ideas and transmit these electronically as intangible or immaterial products, gain particular advantage in the networking economy: Through the Internet and other networking technologies, they have access any time to unlimited amounts of information which is the raw material of knowledge creation. All types of work can gain from greater access to information. For example, the illiterate farmer can sell his produce in new markets, which he has accessed via the internet. While the networking economy has opened new opportunities for job creation, this does not necessarily mean an increase in knowledge or skill requirements. Unskilled jobs, de-skilling and skill polarization in the networking economy also exist (ILO, 2001).

While no studies have tried to quantify the employment generated or the potential arising out of this sector, most experts believe that ICT is one tool that can provide employment opportunities both at its supply side as well as its demand side. However, certain social achievements of a region would determine the success of utilizing this new technology for the regions benefit. Many studies (ILO, 2001; UNDP, 1998; World Bank, 2000) have found that the use and supply of ICT is directly correlated to the education and literacy in the region. Any meaningful gain in employment depends on the achievements in this front.

ICT has created new types of work that favour women because the technology enables work to be brought to homes and allows for better accommodation of work and family schedules. Women have also been able to capture a large proportion of jobs in ICT-enabled services because of the worldwide shortage of skills necessary for work in this sector (ILO, 2001). It is, however, pointed out that unless these are supported by deliberate policies to ensure participation, ownership, education and ICT training for women as well as family-friendly policies in the information economy workplace, the old gender biases will persist.

Internationally outsourced jobs, such as medical transcription work or software services, do make a considerable difference to the lives and career paths of women in developing countries. In software, women enjoy preferences on a scale that they never experienced in any other field of engineering and science. Women occupied 30 percent of professional jobs in the Indian software industry in 2001 (ILO, 2001). The World Employment Report 2001 points out that work in the information economy can be an effective tool for enhancing gender and social equality, with sufficient state interventions. However it may be noted that women's substantial under-representation in the core ICT science and engineering curricula in education systems indicate their exclusion from most of the core ICT occupations (ILO, 2001).

1.7. Issues for research

In fact, the success of ICT in advanced countries point to the fact that a country or region needs to have sound basic infrastructure and human resources as essential prerequisites for taking advantage of the new technology. Here, the state has to play a pro-active role. This is particularly true in the case of state-regions in India where ICT industry has tended to get spatially concentrated. Kerala is one among such centers. How is Kerala relatively placed in regard to the above pre-requisite conditions? Does the state have the relative advantage to exploit the various aspects of ICT for the region's development? Has the state been able to make a mark in the production of ICT products, at least in the software export and ICT-related services on the national and international scenes? If not, what have been the constraints? Are the constraints specific to the region? What are the characteristic features of the processes at work in Kerala's ICT industry? In particular, what have been the salient features of employment, labour market, wages, social security benefits and other aspects especially with respect to the gender dimension?

Given that ICT is an important tool for enhancing productivity and output growth of the regional economy, still there are some critical issues of the types listed above on which analytical studies are lacking in the context of Kerala. The present study is therefore designed to find answers to a few of these and other analytical questions. The basic objectives and the scope of the study, as shown below, are modest. The emphasis is on

understanding one important sector of ICT, the software and services segment, in the state.

1.8. Scope of the Study

The study tries to evaluate the problems and prospects of the Software industry in Kerala. It specifically examines some critical aspects of the structure, labour force and firm's strategies of the industry, with a view to explore the possible constraints to the development of the industry in the state. A detailed study on the organisational, ownership, scale, product, factor proportions and capital structure is attempted and the growth trends are evaluated. Emphasis is also given on understanding the formal and informal sectors, foreign tie-ups and on the sources of technology.

The study also examines some aspects of the labour force in the sector including the size of labour absorption, skill and education levels and sources and methods of labour supply. The study also looks into the gender dimension of the labour force and tries to identify the wage rates and occupational composition of the labour force in the software industries in the state

The study also tries to analyse the firm specific strategies of software companies in the state. The marketing, human resource development and technology strategies adopted by these firms are examined. Moreover, their strategies of diversification, competition and growth are also captured. The study tries to specifically draw the implications of the micro-level findings on the macro-level growth performance of the software industry in Kerala.

An exercise of this nature aimed at identifying the implications of the regional characteristics on the growth of the industry is also important from the point of view of framing appropriate state policy for the industry. While there are a few studies undertaken about the industry in the state (Joseph, K. J., 1999), there seems to be no scholarly studies looking at the macro-level status of the industry in the state. Moreover, the available studies look at an outdated situation. In the recent years, the industry in the state is believed to be slowly coming out of its earlier teething problems.

1.9. Objectives

The main objectives of the study are:

1. To evaluate the problems and prospects of the Software industry in Kerala and to examine the structure and growth of the industry.

2. To understand firm specific strategies in the light of the regional strengths and weaknesses.

3. To discern the characteristics of the labour force and to estimate the role of the state in the development of this industry.

4. To draw the implications of the micro-level findings on the macro-level growth performance of the software industry in Kerala.

1.10. Working Hypotheses

As pointed out earlier, Kerala, apparently, seems to have the necessary prerequisites to utilise ICT for attaining its larger economic objectives. However, in reality, the state does not seem to have really utilised the opportunity, especially in the software industry side. Given this situation, the hypothesis is that the low performance could be due to the certain regional limiting factors or constraints which might have a bearing on the structure, labour force and firm's strategies, all of which, perhaps, have some relationship with the state policy as well. In this context, it is interesting to explore the factors and processes that govern the performance of the software industry in Kerala.

1.11. Sources of Data

The data required for undertaking the study was collected from both primary and secondary sources. The secondary source of data included the published reports and internet portals of Government of Kerala, Technopark, STPT (Software Technology Parks of India, Trivandrum), NASSCOM (National Association of Software and Services Companies), Department of Information Technology, Government of Kerala, MIT (Ministry of Information Technology), Government of India and Internet Data

Corporation-India. Reports by Directorate of Industries-Kerala, Reserve Bank of India Bulletins and annual reports of software firms were also utilised. Other sources of secondary data included annual reports of software parks in the country, the Economic Review, CMIE publications, industry specific national and international journals and magazines like Electronics - Information & Planning by Government of India, Dataquest, etc.

Given the limited availability of secondary data on the software industry in Kerala, this study depended largely on primary data collected through field survey. Primary data was collected from a sample of software industries operating in the state through structured questionnaires and also based on detailed in-depth interviews for formulating case studies. The views and opinion of industry experts and representatives of the Government were also collected for the purpose of the study.

1.12. Methodology

The approach adopted was to undertake a primary survey of the software firms based on a primary survey using structured questionnaire and to then undertake a detailed probing of the major issues that rose, through the case study method. The list of software firms available with the Department of Information Technology, Government of Kerala was used for the primary survey. The list was verified with STPT and Technopark, the major software park in Kerala. A list of 179 units in the state was thus prepared. Of this, 53 units were from the Technopark and the rest were outside the park. 71.70% of Technopark companies and 64.29% of the non-Technopark firms were primarily undertaking Software activities. Stratified random sampling was adopted for selection of 36 sample firms. There is a clear distinction in terms of size, employment, level of activity, export, etc. between Technopark companies and firms outside. Hence, the first level stratum was defined by the location of the firm i.e. whether it was based within Technopark or outside. Another classification of importance was the kind of activity undertaken by the firm. Hence the second level stratum was defined based on the predominant activity undertaken by the firm i.e. software activity or IT enables services (ITES) activity. The resulting sample distribution is as described below in Table 1.4. A structured questionnaire, provided as Annexure 2, was administered to the sample firms identified through the sampling.

Table 1.4. Distribution of sample across type of organisation and activity.

Organisation type	Type of activity		Total
	Software	ITES	
Technopark	8	3	11
Non-Technopark	16	9	25
Total	**24**	**12**	**36**

Technopark companies constituted 31% and non-Technopark firms constituted 69% of the total sample. Considering the sample from the point of view of activity, 67 % of the sample were software firms and 33 % were ITES firms.

Further, in-depth interview were held with top management and key professionals of eight selected firms and the data thus obtained were collated to provide detailed case studies of these firms. The case study approach was undertaken to assess the underlying processes behind the factors identified through the survey that have a bearing on the performance of various types of software firms. The focus of the study was also in terms of identifying the regional characteristics that have contributed to the performance of these firms, the performance being measured in terms of an index of profitability and growth.

The empirical data collected during the study was subjected to various data analysis techniques by applying standard statistical tools to draw scientific inferences based on the objectives of the study.

1.13. Scheme of study

The study is organised in five chapters including the introduction. Chapter 2 discusses the Kerala software industry scenario against the larger background of the software industry situation in the country. The primary data collected through the survey is presented and analysed in Chapter 3. Chapter 4 gives a critical appraisal of the processes at work based on case studies of selected software firms in the state. Finally, chapter 5 summarises the main findings, highlights the existing policy framework in Kerala and

indicates the lines in which the state policy needs to be reformed in order to sharpen ICT as a powerful tool for accelerating economic growth and to act as a catalyst for the overall development of Kerala economy.

Chapter 2

Kerala Software and Services Industry

2.1. The Kerala development experience

This chapter draws the profile of the software and services industry in Kerala. Many international studies have looked at the unique development experience that Kerala has undergone. The initial wave of enthusiasm on Kerala studies, as is now widely known, had its origin in the mid 1970s, when some important studies highlighting certain key development achievements of Kerala, especially in health and education, were published (CDS, 1975). What engaged the scholars and students of development was the paradox that a third world region like Kerala could achieve high physical quality of life for its people, in spite of sharing almost all signs of underdevelopment especially in its commodity producing sectors, with other such regions. In fact, in the process Kerala came to hailed as an inexpensive model of development (The Kerala model), a model for ensuring reasonably high quality of life for people in poor regions without having to wait for reaching higher stages of economic growth and development.

However, certain signs of vulnerability were visible even as the initial statements on Kerala model were being made (George, K. K. 1993, Joseph, K. J. and Harilal, K. N., 2000). The development crisis of the state, set in during the mid 1970s, manifested as a long drawn out stagnation of agricultural and industrial sectors of the economy. The critics of Kerala's experience and "Kerala model" of development have highlighted that the poor growth performance of commodity producing sectors like agriculture and industry has resulted in the slow down in the rate of growth in employment and income generation within the state. It also has reduced the rate of growth in government revenue and thereby investment in economic sectors and expenditure on welfare programs.

All these have tended to threaten the sustenance of the achievements already made in health, education and other human development spheres and the further efforts to improve the quality of life and capability of the people. Thus viewed, there is a development crisis in the state. A view is gaining ground that the accelerated growth of industry is one of the effective ways of resolving the crisis.

However, considering the lop-sided (less diversified) product-structure and inadequate growth rates in fixed capital investment in the state combined with the factors that creates shyness of capital from within and outside the state to flow into conventional industries in the state (Subrahmanian K. K. and Azeez Abdul, 2000). This necessitates a change in the very concept of industrialisation to refer widely to growth-acceleration, not only in conventional manufacturing industries but also service industries.

Considering the weaknesses of the state that limited it from emerging as a industrial destination in the 'old economy', it seems inevitable to have a new vision and strategy, which could fully utilise Kerala's comparative advantage in human resources, and place greater emphasis on developing knowledge-based and service industries, for accelerating the growth of income and employment in industry. There is increasing expectation in Kerala, on the prospect of ICT as an enabler of the region's economic development and as a growth engine to provide solutions to some of its most important problems like high unemployment and low income generating capacity. In fact, the state is interested not only in becoming a major player in ICT production but also in the use of the new technology in various sectors of the economy

2.1.1. The social and physical infrastructure situation

One needs to ascertain whether appropriate social and physical infrastructure required for the proper utilization of ICT exits in the state. Apparently, Kerala can be considered as a strong contender for a region that has all the prerequisites for the development of ICT as well as the development through ICT[1]. Kerala has had a good record in terms of the Physical Quality of Life Index indicators (PQLI). About 37% of the total annual expenditure of the State is earmarked for health and education. It has a large network of health infrastructure with 961 primary health centres and 5094 sub centres.

Kerala is the only state in India, which has a 100 per cent literate population. There are seven universities, thirty-two engineering colleges and hundred and eighty-six arts & science colleges in the state. The annual degree enrolment is 1,44,885 and post graduate enrolment is 14,585 (as per the status in 2000). The annual intake of students in the

[1] Details about Kerala collected primarily from various years *Economic Review* published by the Kerala State Planning Board.

engineering colleges in the state is 14,000 and in the Polytechnics is 15,000. The human resources capability of the state, in terms of both general stream and technical stream, provides an ideal situation for the state to utilise ICT in various sectors of its economy.

In terms of physical digital infrastructure required for ICT based development, Kerala has a strong base. All the telephone exchanges in the state are digital, covering 14 district headquarters and 63 taluk headquarters in the state. Ninety eight percent of the telephone exchanges are connected by fibre optic cables (OFC) to the National Internet Backbone (NIB). The state also has the highest telephone density in the country of 7 per 100, which is India's target for 2005. It also has the highest rural telephone density in the country with 5.1 per 100, which is India's target for 2010. Moreover, submarine cables like the SEA-ME-WE-3 and SAFE have their landings at Kochi and are capable of providing connectivity at 15 gigabytes per second.

The Software industry has been cited as having footloose character, having low capital intensity and putting very little pressure on land availability. The industry has been found to thrive in regions with adequate supply of skilled labour, good infrastructure facilities and factor cost advantages (Heeks, 1998). Kerala has a relative advantage in almost all the above factors and hence could a-priori be considered as a potential destination for the rapid growth of the software industry. However, the available data shows that the level of software activity in the activity in the state is extremely low. The total software export from the state in 2000-2001 was only 0.38% of the total software exports from the country.

Given this situation, it could be argued that the low performance could be due to the certain regional limiting factors or constraints which might have a bearing on the structure, labour force and firm's strategies, all of which, perhaps, have some relationship with the state policy as well. In this context, it is interesting to look at the overall software industry scenario in the state with focus on the regional characteristics that govern the performance of the industry.

The scenario in the state, however, cannot be understood in isolation and needs to be viewed against the growth of the industry in the country. Hence, the salient features of

the Indian software and services industry are discussed in detail before the scenario in the state is portrayed.

2.2. The Indian software industry

The growth of the Indian software industry during the 1990s has been highlighted as one of the biggest achievements by India. The software industry contributes a major portion of the Indian IT industry's revenues. During the year 2000-2001, the software industry's revenue constituted more than 65% of the country's IT industry revenues compared to about 48% during 1994-95. The industry has grown at an incredible rate of 50 per cent per annum over the past few years, is highly export-oriented, has established India as an exporter of knowledge intensive services in the world, and is believed to have brought in a number of other spill over benefits such as the creation of employment and new pool of entrepreneurship.

In the year 2000-2001, the software industry in India was worth US$ 8.26 billion, whereas in 1989-90, the software industry in India was not more than US$ 197 million. Furthermore, the industry has earned 75 per cent of its revenue (totaling $ 6.3 billion) during 2000-2001 from exports. The growth of software revenues and software exports from India in US$ terms are summarized in Table 2.1 and their growth rates tabulated in Table 2.2.

The National Task Force on IT and Software Development (NTIT&SD), set up by Government of India, has projected an export target of US $50 billion by the year 2008 from the level of US $2.6 billion in the year 1998-99. The domestic software industry is expected to grow from its present level of about US $1 billion to a level of US $20 billion by the year 2008.

Except during the financial year 1996-97, the annual export growth rate has been higher than 50 per cent. The growth rates of overall revenues and of exports have tended to converge over the past couple of years indicating that the growth rate of the domestic software market is also picking up.

Table 2.1: Indian Software Industry Revenues and Exports

(US $ million)

Year	Total	Domestic	Exports
1989/90	197	97	100
1994/95	835	350	485
1995/96	1224	490	734
1996/97	1755	670	1085
1997/98	2700	950	1750
1998/99	3900	1250	2650
1999/00	5700	1700	4000
2000/01	8260	1960	6300
2001/02	11200	2700	8500

Sources: based on Hanna (1994), Heeks (1996) and Nasscom (2001 and 2002).

Table 2.2: Growth Rates of Magnitudes of Software Revenue and Exports

	1994/5	1995/6	1996/7	1997/8	1998/9	1999/00	2000/01
Growth Rate of Revenue in US$		34.61	56.14	53.85	44.44	48.65	53.5
Growth Rate of Exports in US$	54.46	51.34	47.82	61.29	51.43	50.94	57.5

Source: from Table 2.1 above.

2.2.1. Software industry and India's economy

The software industry however accounts for a marginal share of India's GNP but it has been rising fast. In 1998-99, the industry accounted for just one per cent of India's GNP. Its share has nearly doubled by 2000-01 (Table 2.3). Even with marginal shares in income, the sector contributed nearly 12 per cent of the growth of national income. Given the rate at which it is growing, it is bound to emerge as an important sector of the Indian economy in the future. The Nasscom-McKinsey report projects a 7.7 per cent share of the sector in the overall economy by 2008.

Table 2.3: Software industry in relation to India's macroeconomic parameters

(in billion US$)

	1998/99	1999/00	2000/01
India's GDP	379.7	404.7	427
Indian Software Industry- Revenues	3.9	5.7	8.3
Share of Software Industry in the GNP, %	1.027	1.41	1.94
India's exports of Goods & services	60.07	67.85	79.76
Exports of Software Services	2.65	4.0	6.3
Share of Software in exports, %	4.41	5.89	7.89

Source: based on Nasscom (2001).

2.2.2. Net export earnings

Considering the country's size and history of inward development, most industries tend to be driven by the domestic market. However, software exports account for 65% of the total software revenue. But it may be noted that many studies have indicated that the net export, earnings is not more than 50% of the gross exports on account of the onsite activities, software purchases from abroad, etc. (Kumar, Nagesh, 2001, Joseph , K J and Harilal K N, 2001 and Heeks, R, 1998). However there is also an argument that the Indian software industry has since come of age in terms of capabilities, sophistication, range of expertise, and worldwide reach (Nagesh Kumar, 2001 and Chandana et al 2001). Table 2.4 indicates the changing trend in the net export earnings of Indian software firms.

Table 2.4: Net Exports of Software Companies

	1994	1995	1996	1997	1998	1999
Foreign Exchange Utilization per unit of. exports	57.41	56.39	61.66	54.65	51.11	48.01
Net Exports per unit of Exports	42.59	43.61	38.34	45.35	48.89	51.99

Source: Kumar, Nagesh (2000).

2.2.3. Nature of software activity in the country

Despite the high growth rates achieved by our IT industry, India's share in the total global IT market is low (0.5%). There are, however, certain product segments where India commands a large market share. For example, in the global cross-country "customised" software market, India has 18.2% market share. But, it has been observed internationally in recent years, that the sales of high value added "packaged" software has grown more rapidly than sales of low value added "customised" software (Mowery, David C., 1996).

Although the magnitudes of exports of software and services from India have grown rapidly over the past decade, the general perception is that these exports comprise low value services. . It was considered to be a rather lower level of skill-intensity compared to software product designing and development and has been termed as 'body-shopping' derisively (Heeks, 1996).

Table 2.5 Software activities in the country (2000-2001)

Type of Software activity	Domestic	Export
1. Projects	28.5	36.5
2. Professional services	5.0	44.1
3. Products and Packages	48.5	7.9
4. Training	4.5	1.7
5. Support & Maintenance	4.0	4.3
6. IT Enabled	9.5	5.5
Total	100.00	100.00

Source: Nasscom website: *www.nasscom.org*

A major portion of India's software export relates to professional services and the contribution by the higher value added products and packages segment to exports is very low (see Table 2.5).

Joseph and Harilal (2001) points out that to achieve the targeted $50 billion in exports, it is important that the industry move away from the current strategy to one based on innovative capacity so that the industry goes up in the value chain and progressively increases offshore development with focus on software products. The trends in the Indian software industry indicate that the industry is moving away from body shopping (on-site) and that an increasing proportion of India's software is developed offshore at the home bases of exporters in India and exported. As a result, the proportion of on-site exports has come down in India's software exports from 90% in 1988 to 56 % by 2000-01, as shown in table 2.6.

Table 2.6: Locational Division of Labour in Indian Software Development

Location of Work	**1988**	**1995**	**1998/9**	**2000/01**
On-site (at client's site abroad)	90	67	57	56
Off-shore (at vendor's site in India	10	33	43	44

Sources: based on Nasscom; Heeks (1996); Nagesh Kumar (2001)

2.2.4. Export destinations

Indian firms have exported software worldwide. However, the bulk (62%) is concentrated in North America, mainly the US, which also is the largest market for software. Europe accounts for 23.5 per cent of India's exports, and the Asia-Pacific for a further 10 per cent (Table 2.7). Language has been identified as one factor that contributes to the high concentration in the US (Kumar, Nagesh, 2001). However, Heeks (1998) points out that India is more 'locked-in' to the US market than others because many Indian businesses have links through family members or friends who are US residents. Moreover, many software developers are US-trained and so they understand that market best. There is a vast predominance of US firms in the all-important collaborations that provide so much of India's software export market.

Table 2. 7: Geographical Distribution of Indian Software Exports, 1999-2000

Region	Percentage of exports
North America	62.0
Europe	24
Japan	4
South East Asia	3.5
Australia & NZ	1.5
West Asia	1.5
Rest of the world	3.5

Source: Nasscom (2000, 2001)

2.2.5. Firm characteristics and strategies

Large firms have dominated software exports since they can exploit the economies of scale and entry barriers that exist in software production. Economies of scale and barriers include those of hardware, staff training, marketing and non-tangible factors like credibility and reputation. The top twenty-five software exporters (in order of revenue) accounted for almost 60 percent share of the software exports revenues in 2000-2001 (Nasscom, 2001). In fact, Chandana Chakraborthy and Jayachandran (2001) found that only a handful of software companies in India have asset size larger than Rs. 300 million. Since Indian software exports are services rather than goods, examples cannot easily be displayed to potential buyers to establish credibility.

There is, therefore, a heavy reliance on reputation, record of accomplishment, references and the skills and appearance of the marketing team, which all go together to determine the Indian firm's credibility. All these credibility-related factors, which principally hinge on track record and spending on marketing, work to the advantage of larger, longer-established firms There are also biases against small and start-up companies in terms of obtaining foreign collaborations and technology, and in dealing with the bureaucracy (Heeks 1996).

However, there is an increasing international orientation of Indian companies About 212 Indian software companies have set up 509 overseas offices or subsidiaries. 266 of these

offices had been set up in North America, 122 in Europe, 59 in Asia excluding India, 25 in Australia-New Zealand, 25 in Africa and 12 in Latin America (Nasscom, 2000). Firms like TCS, HCL Technologies, Infosys Technologies, NIIT, etc have established extensive networks of offices and subsidiaries all over the world to tap opportunities in different markets similar to the operations of a multinational corporation. Moreover, four Indian companies have got themselves listed on American stock exchanges and more are planning such moves. However, foreign participation in terms of joint ventures or subsidiary organisations is limited (Nagesh Kumar, 2001 and Chandana et al, 2001)

International orientation and the increasing professionalism of Indian software enterprises has prompted them to align their processes with global best practices and to obtain international quality certifications. About 250 Indian companies have obtained the International Standards Organization 9000 (ISO 9000) certification by March 2001 (Nasscom, 2001). Moreover, as many as 38 Indian companies have received SEI-CMM[2] certification at levels 3 or above. In fact, India's lead in high maturity levels is clear from the fact that 29 out of 31 non-US companies which have been certified at high maturity levels namely Level 4 and 5 in terms of SEI-CMM are Indian. Of the 31 companies certified at Level 5 worldwide, 16 that are outside the US are in India.

2.2.6. Employment in the software industry

According to Nasscom Surveys, the software industry employed about 3,40,000 professionals on 31 March 2000 including software professionals working in software user organizations compared to 1,60,000 professionals in 1996. According to Nagesh Kumar(2001) the industry has created about half a million jobs including ancillary jobs such as those of data entry operators at a compound annual growth of 28.5 per cent in the past three years. The reports of McKinsey (1999) and NTIT&SD (2000) have projected that the software industry will employ 2.2 million workers by 2008. Half of these jobs, i.e. 1.1 million jobs will be created by an expansion of IT-enabled services in the country by the year AD 2008 compared to 23,000 in 1998-99. Of these, nearly 5,00,000 jobs are

[2] The Capability Maturity Model for Software (CMM or SW-CMM) is a model for judging the maturity of the software processes of an organization and for identifying the key practices that are required to increase the maturity of these processes. The software community has developed the SW-CMM, with stewardship by the Software Engineering Institute (SEI), Carnegie Mellon University (www.sei.cmu.edu/cmm/). The CMM is organised into five maturity levels, with level five as the highest achievable level.

expected to be in back office operations and in content development, compared to 15,200 jobs at present.

Besides the organized segment of the software industry, employment opportunities are fast expanding in the smaller informal or micro-enterprise segment in software and services. Kumar (2000) found smaller enterprises in software customization, data entry, and internet bureau to be growing in terms of numbers and size at a very fast pace. As a result the employment in these enterprises is expected to grow between 50-100 per cent per year. However, the salaries in these enterprises are relatively low to begin with but the sector provides opportunities for fast mobility of personnel upwards. While the larger and more organized enterprises are driven largely by the external demand, the informal establishments cater to rising demand of domestic industry especially the small and medium enterprises for their office automation and customization needs.

2.2.7. The gender dimension of employment in the Indian software industry

Nasscom (2000) survey reveals that although the share of women in software professionals is low at 19 per cent in 2000-2001, it has increased from just 10 per cent in 1993. In the IT-enabled services segment, women account for 37 per cent of the jobs. With the spurt in the growth of ITES, it is believed that the share of women in the software workforce will be on the rise. Earlier studies on the industry had reported an even higher domination of the industry by men with a share of women ranging between 5-10 per cent (Mitter and Pearson, 1992; Heeks, 1996). The domination of the workforce by men, however, does not seem to be due to any gender bias. Even the early surveys do not report any overt discrimination against women in the industry. Among the reasons cited in those surveys for women's observed under-achievements include, a lack of international mobility because of family commitments, regulations against night work preventing companies from hiring them for round-the-clock contracts, and some international clients' reluctance to hire women consultants, especially in the Middle East. The declining dependence of the industry on on-site contracts is expected to remove most of these constraints.

2.2.8. Spatial clustering of software industries

Software industry development in different parts of the world is characterized by a strong tendency of spatial clustering because of agglomeration economies. The software industry in India developed initially in Mumbai and subsequently, especially after the entry of Texas Instruments in the mid-1980s, Bangalore emerged as a centre of software industry development. Bangalore enjoyed several attractions for the industry, including availability of a pool of trained manpower, the existence of Indian Institute of Science, Indian Institute of Management, and the many high technology industrial complexes such as Bharat Electronics, Hindustan Aeronautics, Bharat Heavy Electricals, etc. Besides the mild climate also made it attractive. The development of infrastructure under the aegis of Software Technology Park and subsequently private IT Park helped in the agglomeration of the industry in and around Bangalore (Heeks 1996, Lateef, 1997; Kumar, 2001). Besides, Bangalore and Mumbai, Delhi along with its suburbs namely Noida and Gurgaon emerged as the third most popular concentration of software units (Table 2.8).

Table 2.8: Patterns of clustering of top 600 software companies

City	Number of company headquarters located	Percentage
Mumbai	131	21.83
Bangalore	122	20.33
Delhi and around	111	18.50
Hyderabad	64	10.67
Chennai	55	9.16
Calcutta	25	4.16
Pune	23	3.83
Thiruvananthapuram	14	2.33
Others	55	9.16

Source: Nasscom (2000).

Hyderabad and Chennai are emerging as alternate locations in the south, after the saturation of Bangalore in terms of available infrastructure and scarcity of space. The state government's promotional role has also contributed to the emergence of Hyderabad

as the fourth most important centre of concentration of software companies. The top five cities together account for 80.5 per cent of the 600 top companies. The other cities where some amount of software activity happens include Calcutta, Pune, Thiruvananthapuram, Ahmedabad, Bhubaneswar, etc. The development of the software industry is, therefore, largely concentrated in select major urban centres and their suburbs.

Against the background of the characteristics of the Indian software industry described above, it would be interesting to look at the status of the industry in Kerala. As pointed out earlier in the chapter, the potential for the development of software industry in the state is considered high on account of favourable technical factors like international connectivity and high telephone density, favourable social factors like human resources, health care facilities and educational facilities and favourable economic factors like cost effectiveness.

2.3. IT Software and services industry in Kerala

Kerala has witnessed an array of direct and indirect state interventions in the electronics sector in the last three decades. It was the pioneering state in the country to attempt the development of an electronics industry at the regional level. This manifested in the setting up of the Kerala State Electronics Development Corporation Ltd. (Keltron) in the early 1970s. The Government's approach was to directly enter production as an investor. Keltron made a major impact, not just in the state, but all over the country, so much so that most of the other states also created their own agencies. Keltron had arrangements with a number of small-scale ancillary units, there by offering large employment opportunities directly and indirectly.

However, the presences of Keltron did not make any major impact on the development of electronic units within the state. Moreover, with the onset of liberalised policy regime from the mid 1980s, Keltron slowly lost its focus as an electronics development agency and slowly faded into a major loss making public sector production unit. In spite of creating an institutional mechanism for the development of the electronics industry, the state failed to capitalize on its pioneering effort.

A new set of initiatives was launched in the early 1990s by Government of India and Government of Kerala. The state Government set up the first electronics technology park in the country – Technopark and the central Government set up the Software Technology Park of India, Trivandrum (STPT). In sharp contrast to the earlier policy of direct investment in production, the approach this time was to facilitate software sector growth of the state by providing appropriate environment for private sector to develop.

Technopark is the first such park in the country. At the time when Technopark was conceived and implemented in 1991, software activities in the country were at a very low level. It was believed that this state intervention would provide the lead for the state in achieving rapid growth of the electronics industry in the state and there by provide solutions to larger economic problems like unemployment facing the state.

Technopark was created with a view to provide direct support for setting up hi-tech electronics and software industries in the campus, incubating industries and further channelising the positive impacts of the park to the overall development of the sector in the state. Hence, a proper evaluation of the performance of Technopark has to also consider its impact in developing small and tiny units outside to park to develop. It is often pointed out that this kind of a proper linkage between Technopark companies and companies based outside has not happened and that Technopark has remained as an island of excellence. The type of activities, value addition, export orientation, employment, etc. of companies based in Technopark and outside are very different from each other. Hence, any study on the IT software and services industry in the state has to separately consider these two sectors and then compare and collate the results for getting an overall picture.

2.3.1. Technopark

Technopark is located in 185 acres of land and is currently host to 53 international and domestic companies. The exports from Technopark increased from 70 crores in 1999-2000 to Rs. 150 crores in 2000-2001. The employment generated is about 4710 and the number of trainees at a time is 2000. It is estimated that indirect employment on account of the operations of Technopark companies comes to about 10,000. Technopark has 6.82 lakh square feet area of industrial modules and the construction of another 4.50 lakh

square feet is in progress. Government of Kerala has invested about Rs. 100 crores in Technopark up to March 31, 2001

Of the 53 companies in the park, 30% are US based, 35% from Europe, 5% from middle East, 25% from within Kerala and the rest 5% from outside Kerala. The companies in Technopark undertake a range of activities including embedded software, smart cards, telecom, e-commerce, application software, ERP solutions, CAD, IT enabled services, etc. Technopark has registered a total investment of Rs. 14, 775 lakhs till 2000-2001. This includes foreign investments to the tune of Rs. 6,555 lakhs, non-resident Keralite's (NRK) investments of about Rs. 5,670 lakhs and domestic investments of about 2,550 lakhs, in software and hardware companies.

2.3.2. Software Technology Park of India, Trivandrum (STPT)

STPT came into existence in the year 1992 with the main focus of promoting export oriented software firms in the state by providing timely export clearances and data communication links. All exporting firms need to register with the STPT mandatorily. During the year 2000-2001, twenty-five export oriented companies registered under STPT thereby taking the total number of registered companies to 237, including the companies in Technopark. It is however interesting to note that only 72 out of the 237 registered companies actually exported during the year 2000-2001. This arises on account of two factors (a) the list of 237 is a historically compiled one and does not represent the live cases alone (b) most of the software firms that starts operation gets themselves registered with the STPT in anticipation of export orders, which may or may not fructify. Though STPI centres were started in Kochi, Kozhikode, Palghat, Thrissur and Kollam, in addition to the one in Trivandrum, they have not attracted any serious software export firm.

2.3.3. Status of software industry in Kerala

The software export from the state increased from US $ 11.38 million in 1998-99 to US $ 15.63 million in 1999-2000 and to US $ 24.06 million in 2000-2001 registering growth rates of 37.26% and 53.94% respectively. However, Kerala's share of software export

declined from 0.43% of Indian software export in 1998-99 to 0.39 % in 1999-2000 and to 0.38% in 2000-2001.

The four Southern India states account for about 45% of the total software exports from India. It is hence interesting to compare some of available characteristics of the software industries in these four states. Tables 2.9 and 2.10 trace the growth of software industries in the four states during the last three years.

Table 2.9. Growth of software industry in the four south Indian states.

Exports in US $ million

State	1998-99		1999-2000		2000-2001	
	Units	Exports	Units	Exports	Units	Exports
Tamil Nadu	166	300.37	596	446.41	764	681.45
Karnataka	271	678.24	486	1072.89	812	1634.74
Andhra Pradesh	92	139.04	346	247.00	1206	419.24
Kerala	54	11.38	174	15.63	237	24.06

Source: STPI

While the growth rates among the four states can be compared, one needs to also note that the level of the software industry is different across the states. This point is highlighted in figure 2.1

Table 2.10. Growth rate of software exports from four south Indian states.

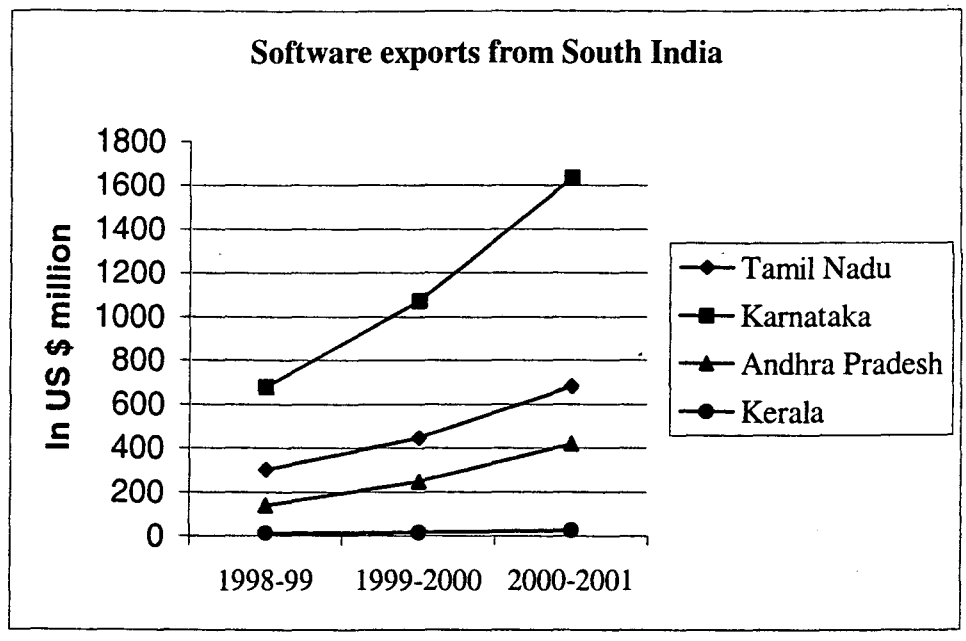
State	1999-2000	2000-2001
1. Tamil Nadu	48.62	52.65
2. Karnataka	58.18	52.36
3. Andhra Pradesh	77.64	69.73
4. Kerala	37.26	53.94

Source: STPI

As seen in the figure, the level of software activity in the four states are different making comparisons purely based on export growths non-meaningful. The fact of the matter is

that the level of software activity in the state is not very impressive, given the advantages that it enjoys.

Fig 2.1. Software exports from four South Indian states during the last three years.



Source: STPI

The above details clearly indicate that Kerala has failed to capitalize on its pioneering efforts of creating institutionalized mechanisms for the overall development of the state. Further it should also be noted that while Kerala was the first state to create a software park in the country, current level of investments in other southern states for creating built up space in software parks far exceeds those done by the state. Table 2.11 gives a comparison of the investments made in the various software parks in the southern states.

Table 2.11. Investment in IT infrastructure, built-up-space created

Park	Area (million sq. ft)	Investment (Rs. Cr.)	Cost/Sq. ft (Rs.)
IT Park, Bangalore	2	1200	3800
Tidel Park, Chennai	2.1	1000	2350
Hitech City, Hyderabad	1.5	2000	2750
Technopark, Trivandrum	0.8	100	1150

Source: Software park websites

However, as pointed out above, in terms of the cost of the built up space, Technopark offers the lowest. The fully burdened cost of operating from Technopark is only US 8 $ per hour compared to the global average of US 15 $. Salaries are found to be only 20% of the international average. Operational costs are less than 50% when compared to other leading Indian cities.

Industry experts point out that Technopark offers the same quality of infrastructure as any other park in the country. They highlight the lack of secondary social infrastructure, near absence of IT ambience in the state and the negative investor perceptions about the state as the most important factors that deter leading software firms in the country from setting up units in the state.

On the other hand, Kerala has also not been able to tap its human resource advantage in this sector as well, even after having the highest density of science and technology personnel in India. It seems imminent that state interventions may be required to increase the demand for domestic software by a planning programme of ICT diffusion in all sectors of the economy. The unique technological, physical and social advantages available in the state, provides an opportunity to achieve rapid diffusion of ICT in various sectors like public sector, education, media, manufacturing and other industries and in services such as trade, banking, commerce, tourism and travel. This could also help in increasing the domestic demand base for ICT products in the economy. According to Hanna (1994) of the World Bank, these kinds of interventions are necessary for starting a process of overall ICT development of the sector

The approach would not only help the state in increasing its overall productivity, but will also help in increasing the employment opportunities in the small scale sector. As pointed out by Nagesh Kumar (2001), any substantial increase in employment in the software sector can be expected only from the small sector.

2.4. State initiatives in diffusing ICT

The state has a very important role in the state in creating the appropriate environment for the growth of software industry. The predominance of the Government in the state in all kinds of economic activities indicate that the largest buyer for ICT products in the

state comes from within the Government. A number of key state initiatives are being undertaken with a view to increase the productivity of Government functioning, improve the citizen interfaces and diffuse the technology to the grass root level. These are expected to create major demand in the local software and services market. Since the software as well as the data has to be created essentially in Malayalam, the local language, it is expected that the local software and services industry would gain by the e-governance activities in the state. On of the major constraints in the diffusion of the technology in the state stems from the fact that the standardised local language keyboard and character encoding scripts are not very popular.

An amount of Rs. 140 crores is being spent by the state Government in the financial year 2002-2003 on e-governance projects. The major initiatives of the Government include the Kerala State IT Mission, Secretariat Wide Area Network, Collectorate computerization, Information Kerala Mission, IT@School, computerisation of priority government departments, FRIENDS, Sevana, etc.

The Government of Kerala created a separate Department of IT in the year 1998 and constituted an IT Mission for the creation and implementation of IT projects in the state and for the promotion of the state as an IT investment destination. Kerala became the third state in the country to announce an IT policy in 1998 which covered aspects of industry, human resources development, infrastructure, IT applications in Government and social informatics. A new policy on IT and ITES industry was announced in 2001 and e-governance was accorded the status of a thrust area in the tenth five-year plan.

Government of Kerala prioritized the Departments for computerisation on the basis of two parameters namely revenue earning capacity and degree of citizen interface. The identified departments and projects where IT is being implemented are Government Secretariat, Collectorates, Local Self Governing Institutions, Treasuries, Revenue, Registration, Employment exchanges, Motor Vehicles, Civil Supplies, Water authority and State Electricity Board. In the area of education, the projects that have been accorded top priority include IT@School, IT educational grid connecting all technical institutions, IT in Universities and Library Network.

Secretariat wide area network project aimed at networking the Secretariat and other public offices is intended to facilitate speedy disposal of files in the Government offices. It is expected that the entire Government Secretariat will be networked by the end of 2002. District treasuries and a few of the sub-treasuries in the state are already online. Moreover, 54 sub registrar offices (SROs) have been fully computerized using PEARL (Package for Effective Administration of Registration Laws) and 100 more SROs are expected to be computerized in the financial year 2002-2003. RDNet, the project for networking all the 152 blocks in the state has been completed.

Information Kerala Mission is a project for networking all the 1157 local bodies in the state. Initially planned for completion in 2000, the implementation of the project has been very slow. However, once implemented, this would be one of the biggest ever projects attempted in any region with such levels of decentralisation.

The Department of IT, in association with the local bodies and eight Government departments has set up an integrated services center called FRIENDS (Fast Reliable Instant Efficient Network for Disbursement of Services) with a view to enable a smooth and transparent citizen to government interface (C2G interface). These centers accept all utility bills, taxes and fees pertaining to the participating departments and offer quality services to the citizens. FRIENDS has been launched in all 14 district headquarters in the State.

The Department of IT along with the State Library Council has launched 14 Rural Information Centers in the rural libraries, one in each district in the state. A package named 'Sevana' provides information on various government schemes, programmes, general information on local bodies, links to important sites and other facts relevant to the rural population.

Government is introducing ICT in all schools as both a pedagogical tool as well as for IT education from the eighth standard onwards. The Government is planning to implement this in two ways, one with the involvement of private sector and the other as a total government program. However, the present coverage of the project, titled "IT @ School", is low and consists of only 100 schools out of the targeted 1200 schools in the state.

With a view to create a pool of highly skilled IT professionals in the state, Government of Kerala set up the Indian Institute of Information Technology and Management Kerala (IIITM-K) in the year 2000. Apart from conducting postgraduate programmes in IT, the institute is also helping the Government in creating an educational grid across all technical institutes in the state and in implementing tele-health projects.

The Department of IT has also initiated a program for software firms in the state to assist them in acquiring ISO certification. The Department of IT in association with the Electronic Regional Test Laboratory (ERTL), under the Ministry of IT, Government of India, provides technical support and financial assistance for the applicant software firms for this purpose.

Government of Kerala has also declared a Rights of Way Policy, permitting private or public sector infrastructure providers who propose to lay optic fibre cables to have the rights of way over public properties including national and state highways, village roads and other public properties for laying cables on a non-exclusive basis.

2.5. Concluding remarks

This chapter tried to portray the software and services industry in the state in the larger background of the regional characteristics and the Indian software scenario. The state, which has already had a development experience, is anxiously looking forward to the new technology as an opportunity to solve many of the serious economic problems that it is confronting today. The excitement over the possibilities of ICT in the region stems, primarily, from the apparent success of the Indian software industry.

The Indian software industry has done remarkable well in the past few years with growth rates of more than 50%. However, it is important to note that the Indian industry caters to the lower value added segment of the global software industry. The recent studies, however, point to the fact that the Indian industry is slowly but steadily moving up the value chain. The chapter also revealed the importance of this sector on the employment situation in the country and the gender composition of the industry. The industry is also characterised by agglomeration of firms in a region and very few export destinations.

The contribution of Kerala's software industry to the overall Indian software industry is not very significant. Considering the fact that the software industry in India is predominantly export oriented, the insignificance of the Kerala software industry becomes clear from the very fact that the region contributes only 0.38% of the total software exports from the country. Kerala has also not been doing well compared to the neighbouring states. The situation seems paradoxical when one considers the fact that the state has the necessary pre-requisites to emerge as a major software destination. It is also interesting to note that the situation is in spite of the fact that the state has been a pioneer in promoting electronics and ICT through active and passive government interventions at different points in time.

Of late, the government has been taking an active role in diffusing ICT, especially into governance. However, these attempts do not seem to have had any major impact in terms of creating a robust software industry base in the state. One could argue that the major reasons for this are the lack of appropriate mechanisms for private procurement and private participation in such projects and thin spreading of resources.

Against the light of the macro level regional characteristics and initiatives described above, it is pertinent to study the constraints and opportunities faced by the software and services firms in the state. It is also important to understand the ways in which firms resolve to take advantage of the opportunities available and how they tide against the constraints they face. We propose to comment on these aspects based on a detailed field survey.

Chapter 3

Survey Findings

The survey was undertaken with the purpose of understanding the salient features of the sector under study and to explore the problems and prospects of the industry in the state. As was described in the first chapter, stratified random sampling methodology was employed and data collected from a sample of 36 firms, employing a structured questionnaire. The sample firms included both Technopark and non-Technopark firms as well as firms undertaking software activity and ITES activity. The analysis also tries to understand the differences between Technopark and non-Technopark firms. Unless otherwise stated, the tables used in the Chapter are prepared based on the data collected through the field survey.

Technopark companies constituted 31% and non-Technopark firms constituted 69% of the total sample. Considering the sample from the point of view of activity, 67 % of the sample was Software firms and 33 % were Information Technology enabled services (ITES) firms. About 73 % of Technopark companies and 64% of the non-Technopark firms are based in software activities. The distribution is as described below in Table 3.1.

Table 3.1. Distribution of sample across type of organisation and activity.

Organisation type	**Type of activity**		**Total**
	Software	**ITES**	
Technopark	8	3	**11**
Non-Technopark	16	9	**25**
Total	**24**	**12**	**36**

3.1. The Organizational structure

The predominant organisational structure for both Technopark and Non-Technopark firms are the Private limited company status, as shown in table 3.2 below. However, while the rest of the Technopark firms have primarily allied with multinational firms, the other non-Technopark units are centered on organisational structures that are suited for smaller sizes. It may be noted that there are no public limited software companies in the state except for the state run Keltron. The fact that the state does not house a single public limited company

also points to the fact that the state has not been able to attract any major player in the Indian software and services industry into the state. This also gives adequate clue about the perception of Kerala as an software production destination by major firms in the country.

Table 3.2 Organisational structure of firms

(values in percentage)

Organisational structure	Technopark	Non-Technopark
Proprietary concern	0	12
Partnership firm	0	8
Private limited company	72.7	48
Subsidiary of MNC	9.1	0
Multinational company	9.1	4
Public limited company	0	0
Self Help Group	0	28
Joint Venture	9.1	0
Total	**100**	**100**

3.2. Structure of firms by capital employed

The above macro-level scenario is further reflected from an analysis of the capital employed by the firms in the state. Only 5.56% of the firms in the state have employed capital exceeding 200 lakhs. The capital employed by Technopark firms is much higher than those of non-Technopark firms. In fact, it is observed that none of the Non-Technopark firms have employed capital beyond Rs. 50 lakhs (Table 3.3). On the other hand, most of the Technopark companies exceed this figure. It seems that companies ready to employ capital worth Rs 50 lakhs and above are the ones that move into Technopark. The rest stays outside the campus, engaging in medium to low value added services and often face problems of inadequate physical and commercial infrastructure necessary for the industry.

Table 3.3 Capital employed by the firms

(values in percentage)

Capital employed (Rs. Lakhs)	Technopark	Non-Technopark
1-5	0	32
6-10	0	16
11-20	0	40
21-30	0	8
31-50	18.2	4
51-80	27.3	0
81-150	9.1	0
150-200	27.3	0
Above 200	18.2	0
Total	100	100

It is further observed that 85% of the total turnover is contributed by only 11.11% of the firms indicating an economic concentration of production.

3.3. Size of firms in terms of employment

Apart from a very few firms in the state (9.1% of the Technopark firms and 4% of the non-Technopark firms), the employment per firm is restricted below 100 (table 3.4). It may be noted that the lower employment size associated with some of the Technopark companies are on account of their highly specialised work, requiring only a few but highly skilled manpower.

Table 3.4 Size of employment of the firms

(values in percentage)

Employment (numbers)	Technopark	Non-Technopark
1-10	18.2	16
11-20	18.2	42
21-30	27.3	20
31-50	9.1	8
51-100	9.1	0
101-200	9.1	0
201-300	0	4
Above 300	9.1	0
Total	100	100

The predominantly lower size of capital and employment gives a clear indication of the relatively lower level at which the industry is operating in the state. This has also acted as a major constraint for the state to emerge as a serious competitor in the software sector.

Moreover, the state also lacks the presence of key national and international software firms. Their presence would otherwise have further attracted larger firms in to the state, as has been the case in Bangalore, Mumbai, Noida, etc.

3.4. Capital Employed per employment generated

It was found through the survey that the capital employed per employment generated in the state comes to Rs. 3.28 lakhs. The details of the capital employed per employment generated under various segments are given in table 3.5.

As shown in the table, Rs. 5.56 lakhs worth of capital is employed by a Technopark based software company when an employment opportunity is created in this sector, compared to Rs.1.24 lakhs by an ITES company based Technopark, 0.59 lakhs from Non-Technopark firms and Rs. 0.27 lakhs from Non-Technopark ITES firms.

Table 3.5 Capital employed per employment

(Rs. in lakhs)

Type of activity	Technopark	Non Technopark
Software activity	5.56	0.59
ITES activity	1.24	0.27
Composite value	4.25	0.41
Overall Composite value	3.28	

While this implies that the employment generation capacity per unit of investment is higher among Non-Technopark units, the productivity and value addition of Technopark based companies are far higher than non Technopark firms. The average revenue earnings per employees is shown in table 3.6. While the components of productivity includes both capital and labour, the increase on account of labour can be correlated to the wage differential in these sectors.

Table 3.6. Revenue generated per employee

(Rs. in lakhs)

Type of activity	Technopark	Non Technopark
Software activity	5.59	0.83
ITES activity	1.30	0.44
Composite value	4.29	0.57
Overall Composite value	3.35	

It is observed that, while Technopark companies cater to a higher valued added segment of the software market, non-Technopark firms cater to the lower value added segment. It should be noted that the export intensity of Technopark companies is as high as 86% compared to 40% in the case of non-Technopark firms undertaking software activities. In the case of ITES activities, the export intensity of Technopark companies is about 96% and that of non-Technopark firms is only 56%. This difference in export intensity across Technopark and non-Technopark units also exhibits itself as the productivity differential among the different sectors.

3.5. Total investment and employment

It was observed that Technopark companies exceeded non-Technopark firms in terms of investment, employment and turnover. The details of the same are tabulated and provided in table 3.7. It is interesting to note that while non-Technopark firms account for only 6.19% of the total investment and 7.08% of the total turnover, they account for 42.75% of the total employment.

Table 3.7. Distribution of investment, employment and turnover

(values in percentage)

Category	Investment	Employment	Turnover
Technopark	93.81	58.25	92.92
Non Technopark	6.19	42.75	7.08
Total	100	100	100

It is very clear that the employment generation capacity with low investments is higher for non-Technopark firms. Technopark companies however clearly lead in terms of absolute employment and value addition. This would mean that an appropriate strategy needs to be

employed by the state for the development of these clearly identifiable niche sectors, one from the point of view of high value addition the other from the point of view of employment. Both these are basic objectives for the larger development of the region.

3.6. Business Areas and Service Types offered.

The following table 3.8 provides the details regarding the different business areas and service types in which the firms are engaged. The pattern once again highlights the sharp contrast between Technopark and non-Technopark firms. An aspect to be noted is that the non-Technopark firms have to concentrate on a few service sectors including Government and that only very few firms prepare software for the manufacturing sector.

Table 3.8 Business areas of activities

Business Area	Percentage of firms involved in the sector	
	Technopark	Non Technopark
• **Banking**	36.36	4
• **Medical**	36.36	16
• **Warehouse, Retail & Distribution**	36.36	27.27
• **Multimedia and Entertainment**	36.36	27.27
• **Education**	36.36	27.27
• **Travel and Tourism**	18.18	4
• **Manufacturing**	18.18	4
• **Government**	18.18	27.27
• **Transport**	18.18	4
• **Construction**	18.18	4
• **Others**	9.1	0

46.67% of Technopark companies and 26.67% of non – Technopark firms are involved in producing customized software. 46.67% of non-Technopark firms are in the data processing activities of various kinds, as indicated in table 3.9. The lower domestic manufacturing base combined with a relatively better performing service sector seems to have made non-Technopark units to concentrate on the latter sectors.

Table 3.9 Types of service offered by firms.

Service Type	Percentage of firms involved in the sector	
	Technopark	Non Technopark
Customized software	45.45	28
Internet related		
Using HTML, JavaScript, Page Hosting	36.36	20.00
Using Java, Active X or CGI Programs	27.27	9.1
Data processing/Transcription/Billing, etc.	18.18	48
Systems software	9.1	9.1
Design and Engineering software	9.1	9.1
Communication software	9.1	9.1
Maintenance of Legacy systems	9.1	9.1

3.7. Branded packaged software products.

28.6% of Technopark companies and 71.4% of the non – Technopark firms have introduced a branded packaged software product in the last 3 years. 45.5% of the branded packaged software products belong to educational sector. 18.2% of the products belong to the warehouse, retail and distribution sector. The branded products prepared by non-Technopark units are exclusively aimed at catering to the domestic market. One area of focused activity for branded domestically developed software is the educational sector. The high literacy rate and the continued interest by all sections of the population to educate their children and to possibly provide professional education has been an opportunity exploited by the local players in terms of providing branded educational softwares.

3.8. Domestic buyers / buying sectors

61.54% of the firms catering to the domestic market directly or indirectly provide their service to Government of Kerala and its agencies. 38.46% of the firms cater to shops and establishments.

The historically low industrial base in the state has also been reason for the low domestic demand for software and software services. Hence the single largest demand for these

services comes from the public sector in the state. The table 3.10 shows this over dependence of firms on Government and Government agencies.

Table 3.10 Major domestic buyers/buying sectors.

Buyers / Buying sectors	Percentage of firms
1. Government of Kerala	61.54
2. Shops and Establishments	38.46
3. IT firms	30.77
4. Local bodies	30.77
5. Tourism sector	23.08
6. Educational sector	23.08
7. Government of India	23.08
8. Construction sector	15.38
9. Sub contract	15.38
10. Others	15.38

3.9. Major Export Destinations

It is seen that the export of software and ITES from the state happens primarily to five destinations. They include USA/Canada, Middle East, Europe, Australia and Asian countries other than Japan as noted in the table 3.11. It may specifically be noted that out of the total ITES export from the state, 93.75% is to the USA/Canada. Unlike the all India scenario where the export to USA alone from India is 62%, the Kerala industry caters equally to the Middle East and European markets as well. This was one of the reasons why the state was not heavily affected like others after the September 11 crisis.

Table 3.11 Major export destinations

No.	Destination	Percentage of Export
1.	USA/Canada	33.8
2.	Middle East	33.4
3.	Europe	27.71
4.	Australia	3.7
5.	Asian countries other than Japan	1.16

3.10. Gross average monthly salaries

Table 3.12 provides details on the gross average monthly salaries across the various categories. The increased labour productivity exhibited by Technopark companies also gets highlighted in the wage rate differential in each of the sub categories. As the following table highlights, there is considerable wage difference between all streams of professionals and skill categories among Technopark and Non-Technopark firms.

Table 3.12. Average monthly salaries of various categories.

(Amount in Rs.)

Activity	Qualification / Level	Units based in	Years of experience	
			Less than one year	One to two years
Software activity	Post Graduate or above in Engineering	Technopark	10,917	13,143
		Non Technopark	7,750	9,000
	Engineering	Technopark	8,250	9,893
		Non Technopark	5,136	6,409
	Other Degrees	Technopark	5,125	7,000
		Non Technopark	2,857	3,429
ITES activities	Highly Skill	Technopark	5,125	6,333
		Non Technopark	3,000	3,500
	Medium Skill	Technopark	3,500	4,333
		Non Technopark	1,415	1,643
	Low Skill	Technopark	1,750	2,000
		Non Technopark	940	1,080

3.11. Total annual payroll

The average annual wage bill of Technopark companies compared to non–Technopark firms, is on the higher side. While 72% of non-Technopark firms have their firm's annual gross payroll (including salaries, wages, commissions and bonuses) between the range one to ten lakhs, only 9.1% of the Technopark companies come under this category. The following table 3.13 points out the differences among Technopark firms and non-Technopark firms with regard to their average annual payroll.

Table 3.13 Average annual payroll

(values in percentage)

Payroll	Technopark	Non Technopark
1- 10 lakhs	9.1	72
10 – 25 lakhs	36.4	16
25 – 50 lakhs	27.3	8
More than 50 lakhs	27.3	4
Total	100	100

3.12. Methods of Recruitment

There are various methods of recruitment adopted by software and ITES firms, which are unlike the methods followed in the conventional manufacturing sector. Considering the shortage of skilled labor in the sector, firms usually approach the deserving prospects rather than the other way. One important method adopted by firms is to conduct campus recruitments in technical institutions. It may however be noted that such a strategy can be adopted by firms only if they have a good market stature and brand image. Otherwise, these firms will fail to get good quality persons as the cream of the technical institutions end up in multinational and leading national firms. This is the major reason why the recruitment strategy followed by reputed software firms outside the state is not the predominant method followed in the state.

A composite ranking score based on the first three methods of recruitment adopted by the firms is tabulated and presented below in table 3.14. The overall scenario indicates that while the Technopark companies adopt more formal paths for recruitments than non-Technopark firms. The overall composite score indicates that voluntary bio-data submission is the single most important method of recruitment by firms. Advertisements and internal informal channel ranks second and third in this category.

Technopark based firms use campus recruitments also as a method of recruitment. ITES firms use walk-in-interview as a major method of recruitment. It is interesting to note that unlike the national level situation, only a very few firms use agencies to recruit candidates.

Table 3.14. Methods of recruitment by organisation and activity.

	Composite score[1] obtained				
	Common	Technopark	Non - Technopark	Software activity	ITES activity
Voluntary Bio-data submission	44 (1)	20 (2)	24 (1)	24 (3)	19 (1)
Through advertisements	40 (2)	29 (1)	11 (3)	31 (1)	9 (3)
Internal Informal channel	32 (3)	9 (3)	23 (2)	25 (2)	5
Walk-in-interviews	14	6	8	2	12(2)
Through an agency	12	6	6	10	2
Campus recruitments	0	9 (3)	0	9	0
External informal channel	10	5	5	7	0

3.13. Training

Continuous training is considered as a key success factor for software and ITES firms. Both Technopark companies and non-Technopark firms seem to discount this fact and hence focus on imparting regular training to its employees. The following table 3.15 provides a comparative picture of the number of training sessions provided by Technopark and non-Technopark firms.

It is interesting to note that most firms focus generally on providing in house customised training rather than availing external training facilities. 54.5% of the companies based in Technopark and 68% of the firms based outside do not provide any external training to its employees, as shown in the table 3.16.

[1] Composite scores in this chapter have been computed as a weighted index based on the number of respondents that support a rank against each factor. The score is calculated as a summation of the product of the number of respondents indicating a particular rank and the weightage given to the rank. Based on higher value of the composite score a better ranking is indicated for factors in the tables provided in this chapter.

Table 3.15 Number of in-house training sessions per year
(values in percentage)

Number of times a year	Technopark	Non Technopark
None	0	8
1 – 3	27.3	64
4 – 5	18.2	12
6 – 10	45.5	0
More than 10	18.2	16
Total	100	100

In analyzing the scenario, one needs to understand the fact that the reasons for not availing external training sections by Technopark companies and non-Technopark firms are different. Companies in Technopark have specialized HRD department, catering to the specific training needs identified in the organisation, based on the detailed training plans. In the case of non-Technopark firms, however, it is the resource constraints that compel them from not availing external training sessions.

Table 3.16 Number of external training sessions.
(values in percentage)

Number of times a year	Technopark	Non Technopark
0	54.5	68
1 – 3	45.5	24
Above 3	0	8
Total	100	100

3.14. Major components of training

The technical component imparted through training programmes is above 70% in majority of cases (80.56%). In fact, 33.3% of firms have only technical component in their training programmes. This includes 44% of non-Technopark firms and 9.1% of Technopark companies. Behavioral, communication and language training are also imparted apart from technical training in some of the firms.

It may be noted that the technical component of training is higher among non-Technopark firms, compared to Technopark companies, higher among domestic firms than export-based firms and higher among ITES firms than software services firms. This only points to the need for providing soft skills for the employees of exporting and high value adding software firms.

Firms usually spend their training budget for providing technical training. As firms grow and the firm's income generation capacity and training funds increases, the focus shifts to non-technical, soft skill development training also.

It may be noted that for firms to enter high-end software market, a focus on providing soft skills is absolutely necessary. However, some firms do not have the necessary training funds / resources for developing these skills. This eventually becomes a limiting factor for the smaller firms to enter and operate in the export market.

3.15. Women's participation

It is observed from the survey that the average women's participation in the software services and ITES Industry in Kerala stands at 39%. As shown in the table 3.17 below, women's participation is more in the lower value added ITES activities, both in the case of Technopark and non- Technopark firms. It has to be noted that the women's participation in the non–Technopark software activity based firms is as low as 12%. This figure along with the fact that wage rate in the ITES sector is substantially lower than that in the software activities points to the fact that women are employed more in low value added low wages sector. However, the women's participation in software and services activity in Kerala is higher than the all India rates. The women's participation in software activity is estimated at 19% and that in ITES at 36% at the national level.

Table 3.17 Women's participation in software/ITES activity

(values in percentage)

Type of activity	Technopark	Non Technopark
Software activity	39	12
ITES activity	51	41
Average participation	43	29
Overall Average participation	39	

There is also a very poor representation of women in the top 10% of the firm's hierarchy. In fact, 56.7% of the firms do not have any women representation in the aforementioned hierarchy, as seen in table 3.18

Table 3.18 Women's participation in top management.

Women's participation in top management	Percentage of firms
No participation	58.33
1% – 30%	22.22
>30%	19.44
Total	100

19.44% of the firms, having more than 30% women participation in top management seen above is mainly on account of the Kudumbasree units covered in the study. These units are run and managed totally by women. Kudumbasree units are self help groups consisting exclusively of women from below the poverty line families. These units have an umbilical connection with the government and hence benefits from the centralised sourcing of data entry work from the Government. The low level participation pattern does not show any major variation across the categories like Technopark and non-Technopark or Software and ITES activities.

3.16. Employee attrition

Eighty percent of firms had on an average 5% or less than 5% of their technical employees leaving the firm annually. In fact, most firms expressed the feeling that employee attrition is not a very serious problem for them. The attrition rates do not have any correlation with the firm being located within Technopark or not or with the kind of activity.

3.17. Alliances with Foreign firms

63.64% of the firms based in Technopark and 40% of the firms based outside have alliances with foreign companies. For firms having alliances and housed within Technopark, 50% of alliance is with USA/Canada based firms, 37.5% with European firms and 12.5% with companies based in the Middle East.

37.5% of the firms having alliance and based in Technopark are subsidiaries of foreign firms, 25% are joint ventures, 12.5% have technology transfer agreements and the rest 25% have marketing agreements.

It is also seen that 100% of the alliances of the non – Technopark firms are with companies based in USA/Canada. 50% of the alliance sample firms of non – Technopark firms are based on marketing / distribution agreement and 50% based on strategic alliance with focus on marketing.

While alliances by Technopark companies are based primarily for reasons of sourcing technology expertise and capital, non-Technopark firms utilise alliances primarily as a marketing strategy.

3.18. Origination of Project

The major difference in terms of marketing strategy adopted by firms in Technopark and outside is outlined in the table 3.19 given below. Most of the business offers for the Technopark companies is routed through their marketing offices outside or through their marketing efforts from within the state. The approach is to extend themselves to the customers rather than waiting for signals from the customer. Majority of the firms based in Technopark have the necessary resources to undertake such kind of aggressive marketing strategies.

On the other hand, non-Technopark firms are at the mercy of customers and get their projects based on either a direct response from the customer or through a consultant or through an open tender, all of which are initiatives taken by the customer. This kind of an approach is due to the fact that most non-Technopark firms do not have the necessary resources for attempting aggressive marketing strategies including setting up of offices abroad.

Table 3.19. Origination of projects

	Composite score obtained				
	Common	Technopark	Non Technopark	Software activity	ITES activity
Through Customer's initiative	**36 (1)**	**13 (3)**	**23 (1)**	19	**17 (1)**
Marketing office outside	**34 (2)**	**32 (1)**	2	**26 (1)**	**8 (3)**
Through IT Consultants	**33 (3)**	12	**21 (2)**	**25 (2)**	**8 (3)**
Marketing efforts primarily from Kerala	31	**16 (2)**	15	**23 (3)**	**8 (3)**
Through an Open Bid	24	8	**16 (3)**	13	**11 (2)**
Sub-contracting mechanism	19	6	13	11	**8 (3)**

3.19. Primary competitors

The respondents were requested to identify three locations where they believed their primary competitors were based. Cutting across organisational and activity differences, majority of firms strongly consider their primary competitors to be based in India (table 3.20). The second location identified by all categories is the United States of America. Most firms also realize the growing threat from China for their business, especially in terms of the cost factor.

The fact that Chinese competition is seen only in terms of cost competition is evident from the fact that firms based in Technopark undertaking high-end software development do not consider the threat from China to be a serious one at this point in time.

Table 3.20. Perception of the location of primary competitor

	Composite score obtained				
	Common	Technopark	Non Technopark	Software activity	ITES activity
India	**48 (1)**	**25 (1)**	**23 (1)**	**35 (1)**	**13 (1)**
USA	**34 (2)**	**24 (2)**	**12 (2)**	**25 (2)**	**9 (2)**
China	**21 (3)**	**13 (3)**	8	**16 (3)**	**5 (3)**
Eastern Europe	16	8	8	14	2
Singapore	8	4	4	6	2
Others	14	4	**10 (3)**	14	0

3.20. Research and Development (R&D) effort by firms

The data shows that most of the firms based in the state are taking R&D seriously. This is especially true about software firms and more specifically those housed inside the Technopark. However, as shown below in table 3.21, 83.3% of the ITES firms and 8.3% of the software firms have not made any effort in undertaking Research and Development activities.

Table 3.21 R&D efforts by firms

(values in percentage)

R & D effort	Software activity	ITES activity
No effort	8.3	83.3
Low	37.5	0
Medium	20.8	8.3
High	33.3	8.3
Total	100	100

It is interesting to note that there is no significant correlation between capital employed and R & D efforts or any significant difference between firms based within Technopark and outside in terms of the seriousness of efforts.

3.21. Major strategic advantages

Strategic advantage options provided to the respondents included organisational advantages like high quality, marketing and satisfied clients and regional advantages like low cost, human resource availability and location advantage. Before looking at the specific options selected by the respondents, it is important to note that location and marketing are not among the major strategic advantages identified by firms under any category.

Majority of the firms consider low cost as the key advantage they have in business, while quality has been emphasised by the firms belonging to Technopark. Human resource availability though considered important, is not the primary advantage for most firms. Table 3.22 brings out the identified major strategic advantages of each category.

Table 3.22. Strategic advantages of firms

	Composite score obtained				
	Common	Technopark	Non Technopark	Software activity	ITES activity
Low cost	**52 (1)**	**20 (2)**	**34 (1)**	**38 (1)**	**18 (1)**
Satisfied clients	**41 (2)**	**19 (3)**	**22 (2)**	**25 (2)**	**14 (3)**
High quality	**38 (3)**	**24 (1)**	14	22	**16 (2)**
Human resources	34	**19 (3)**	**15 (3)**	**24 (3)**	10
Location advantage	9	5	4	7	2
Marketing	6	5	1	4	2

3.22. Most important problems faced in domestic market

As pointed out earlier, the absence of a dynamic manufacturing sector and the over dominance of the public sector in all activities in the state, has led to a situation where Government and its agencies are the major buyers of software and ITES in the domestic market. This factor needs to be discounted before attempting to analyse the major problems in the domestic market highlighted by firms.

Table 3.23 Most important problems faced by firms in the domestic market

	Composite score obtained				
	Common	Technopark	Non Technopark	Software activity	ITES activity
Preference given to PSUs	**43 (1)**	**27 (1)**	**16 (1)**	**33 (1)**	**10 (2)**
Lack of domestic computerization	**24 (2)**	8	**16 (1)**	**14 (3)**	**10 (2)**
Finance / Capital	**20 (3)**	**11 (2)**	**9 (3)**	**17 (2)**	6
Marketing access	19	8	**11 (2)**	5	**14 (1)**
Manpower shortage /skills	13	**10 (3)**	3	13	0
Physical infrastructure	8	0	8	0	**7 (3)**
Lack of government support	7	3	4	1	3
Bureaucratic hurdles	0	4	2	5	1
Employee attrition	0	4	2	5	1
General labour issues affecting the state	0	8	0	5	3
Labour problem	0	0	4	4	0

On account of the complexities of the technology and the need to adhere to Government procurement norms, most Government departments and agencies prefer national and state agencies to implement their IT projects. This has led to a situation wherein the private sector firms in the state fail to get adequate orders in the domestic market. A few firms, however, have made sub-contracting arrangements with the IT implementing PSUs and thereby undertake the work at much reduced profitability.

The preference shown by Government and its agencies to the IT implementing PSUs have been highlighted as the primary problem by firms operating in the domestic market. Lack of domestic computerisation efforts and access to capital and market are identified as other major constraints for operating in the domestic market. The firms do not consider labour problem, the general labour issues affecting the state, bureaucratic hurdles and employee attrition as major issues affecting them in the domestic market. The responses are captured in table 3.23

3.23. Most important problems faced by exporting firms

Lack of easy access to the market has been identified as the single most important problem faced by exporting firms. Non-availability of adequate capital is also an important constraint for many exporting firms. The non-availability of adequate employable human resources having the specialised skills necessary in the export market is another major constraint for exporting firms.

Two major constraints for export-based non-Technopark firms are the lack of good quality physical (e.g. availability of uninterrupted power) and commercial infrastructure (e.g. high speed internet connectivity). The availability of these facilities at international standards is the primary reason that makes Technopark an island of excellence in the state.

Table 3.24 Most important problems faced by exporting firms

	Composite score obtained				
	Common	Technopark	Non Technopark	Software activity	ITES activity
Marketing Access	40(1)	30(1)	10 (1)	33 (1)	7 (1)
Finance / Capital	15 (2)	9 (2)	5 (3)	12 (2)	2
Manpower shortage	14 (3)	14 (3)	0	11 (3)	3 (3)
Physical infrastructure	13	3	9 (2)	9	3 (3)
Commercial infrastructure	12	2	10(1)	10	2
Lack of government support.	8	3	5(3)	5	0
Investor perceptions about Kerala	7	7	0	3	4 (2)
Unattractive incentive / subsidy schemes	0	5	0	3	0
Tariffs and other barriers	0	0	3	1	0
Quality certification	0	0	0	0	2

3.24. Major reasons for being in Kerala

The most important reason for locating the firms in Kerala seems to be the fact that the chief promoter is from the state. Most Technopark companies, however, chose the state because of the availability of Technopark. The other major factors include employable human resources and cost advantages.

The state has been attempting to highlight its strengths in terms of its high quality of social infrastructure, physical and commercial IT infrastructure and Government support to attract investors from various parts of the world. The survey reveals that this attempt has not been very successful, since most of the existing firms have based their operation primarily because of the fact that their Chief Promoter is from the state. The messages from the Government seem to at best attract Non Resident Keralites (NRK) in to investing in Technopark. In fact 54.55% of the Technopark firms have 100% NRK contribution. This

situation is unlike the ones seen in the leading software destinations of the country where firms have moved in from different parts of the world, based on the comparative advantage of the location.

Table 3.25 Primary reasons for locating the firm in Kerala

	Composite score obtained				
	Common	**Technopark**	**Non Technopark**	**Software activity**	**ITES activity**
Chief Promoter belongs to Kerala	**108 (1)**	33	**75 (1)**	**68 (1)**	**40 (1)**
Employable human resources	**94 (2)**	**44 (2)**	**50 (2)**	**62 (1)**	**32 (2)**
Cost advantage	**87 (3)**	**42 (3)**	**45 (3)**	**62 (2)**	**25 (3)**
Technopark	52	**52 (1)**	0	**40 (3)**	12
Government Support	24	13	11	18	6
Social infrastructure	23	15	8	10	13
Incentives & Subsidies	20	6	14	6	14
Others	6	6	0	4	2
Physical infrastructure	18	13	5	11	7

3.25. Major findings from the survey

The survey has clearly brought out the aspects relating to structure, labour force and firm strategies employed by IT software and services firms in the state. A contrast of the above factors between Technopark and non-Technopark firms has also been undertaken. Through this process, it was also able to identify some of the major constraints and opportunities of the Kerala software industry.

It was found that the firms in the state are primarily small in size in terms of capital employed, turnover and employment. The study points to the sharp contrast between the

characteristics of Technopark and non-Technopark firms. The fact that about 94% of the total investment in the Kerala software industry is made in the Technopark gives a clear indication of the importance and over prominence of the facility. It is further seen that most of the software companies based in Technopark invested in Kerala, primarily on account of the presence of the park. It has also provided an opportunity for technically qualified Non Resident Keralites to invest in the state. However, the park remains in isolation and does not seem to have any major linkages with the firms outside the park. The units outside the Technopark are very small in size and do not have the necessary resources to access foreign markets on their own.

Technopark has been partly successful in attracting small and medium software firms into the state. However, the fact that such international quality infrastructure is a prerequisite for software investments has serious implication on the kind of facilities that the state needs to create to attract investments into the state.

The software industry in the state caters to a variety of business activities, with a focus on serving the service sectors rather than the manufacturing sector. While none of the major firms are producing branded softwares, a few of the smaller players are attempting them with very little success. The larger issue confronting the smaller firms in the state is the lack of domestic demand and the absence of proper framework that facilitates private participation in Government IT projects. The lack of enough experience in the domestic market also hampers access to the export market. This eventually will lead to a situation where these firms would continue to remain with the same kind of activities without moving up the value chain. Unless these domestic firms outside the park are given opportunities to transcend the value chain, it is unlikely that the employment opportunities expected from the sector will fructify.

It is interesting to note that, unlike the national scenario, where 62% of the exports are to USA, the exports from Kerala are almost equally distributed among USA/Canada, Middle East and Europe. The fact that Middle East is a major export destination points to the importance of formal and informal networking in the client site, which is required for the growth of the sector. The strong Malayalee diaspora based in the Middle East could continue to help the growth of the local software industry.

While most of the firms in Technopark have chosen to have alliances with foreign partners with a view to source know-how and technology, firms based outside have used these arrangements, primarily, for marketing. In fact, marketing happens to be the single most important constraint faced by the firms in the state. Larger firms, especially those based in Technopark, have fought against this constraint by starting their marketing offices close to the client site. Almost all the firms believe that their primary competitor is based in India itself. Firms have generally felt the need to invest in R&D activities, since they believe that continuous innovation is the key to growth and development.

One big advantage that Kerala enjoys is in terms of the cost factor. Since the margins in the industry are plummeting and also since cost sensitive ITES sector is showing signs of growth, Kerala might have a fresh chance. While there is a great difference in the monthly salaries of various categories of the labour force based in Technopark and outside, fact remains that these are much lower than the salaries offered in major software destination in the country. It is, however, interesting to note that the industry is not fully satisfied by the quality of the human resources offered to the sector by the state.

The method of recruitment followed generally by firms in the state is informal in nature with very few leading companies alone resorting to campus interviews. Moreover, the type mode and frequency of training provided by the firms depend very much on whether the firms are based within the Technopark or outside. Technopark companies have their own human resources department and they focus on the soft skills like communication, presentation skills, etc. apart from imparting technical training. However, the firms based outside find it difficult to undertake continuous skill upgradation and almost always looks at imparting technical training alone

It was seen that the women's participation in the software industry in the state stands at 39%. This is higher than the women's participation rates described for the Indian software industry. It is expected that more and more women are likely to enter this industry, mostly in the lower value adding ITES sector.

The state would ideally benefit from a combination of high value adding software activity and high employment generating ITES firms. This calls for a much focused state intervention aimed at facilitating the growth of both these segments. A software

infrastructure master plan needs to be prepared to cater to both the segments. It needs to take steps to increase the facilities in Technopark and further in establishing other international standard infrastructure, like the one available in Technopark, possibly in Kochi. The state could ideally play the role of a facilitator to channelise private investments for this purpose.

However, it needs to more actively intervene in the domestic market by adopting strategies for the rapid diffusion of ICT in various sectors of the economy, which would push up the domestic demand for software, provide more employment opportunities and would in the long run lead to an increased productivity of the economy. The state also needs to concentrate on leveraging the educational endowment and to create employable human resources for the industry. It also needs to undertake a focused campaign for imparting IT literacy to the public in general so that they are able to use IT in their day-to-day activities.

The survey brought out the salient characteristics of the software and services industry in the state. The survey was able to identify some of the critical factors that decide the success and failure of software and services firms based in the state. It emerges that the regional characteristics govern the success of software firms substantially. While presence of Technopark, availability of human resources and cost factors have been cited as advantages for Kerala, issues like infrastructure constraints and marketing confronts the state. In the background of the field survey and the emerging issues, it would be interesting to have a more detailed understanding of the underlying processes behind these identified factors. Case studies of selected firms operating from the state was undertaken for this purpose and the next chapter discusses the cases in detail.

Chapter 4
Conditions for the Development of Software Industry in Kerala – Some Cases

As pointed out in the last chapter, the case study approach was undertaken to assess the underlying processes behind some of the major factors identified through the survey, that have a bearing on the performance of various types of software firms. The focus of the study was also in terms of identifying the regional characteristics that have contributed to the performance of these firms, the performance being measured in terms of an index of profitability and growth. Accordingly a list of successful, not very successful and failure cases were identified and included for the study.

4.1. The firms

The firms selected for the case study are Network Systems and Technologies Private Limited (Nest), Sun Tech Business Solutions Private Limited (Sun Tech), InApp Information Technologies (India) Private Limited (InApp), Focal systems (India) Private Limited(Focal), KRAN systems Private Ltd (KRAN), Enter Technologies Private Limited (Enter), Indsoft Infotek and Services Private Limited (Indsoft), and a Kudumbasree IT unit.

Nest, an ISO 9001 and CMM level 5 company, is one of the most successful software companies in Kerala and is part of a US $30 million group. The activities of the company range from software development to network management. Nest has been providing engineering and business application solutions to international clientele in various parts of the world including United States (US), Japan, Europe, Australia and the Middle East.

Sun Tech Business Solutions (P) Ltd is a software solution provider operating in the area of convergent billing and customer care for transaction based services, with special focus on the telecom sector. Sun Tech operates worldwide, and has a major presence in telecom service sectors in Europe, Asia Pacific and India. It is another successful locally grown company that has become a major competitor to even multinational corporations, in the national and international market.

InApp is an Indo-US venture, with a primary focus on internet-based development. The company takes its origin from the convergence of a group of IT professionals who got together through software assignments abroad. The company provides IT-related products and services to clients around the world, with particular focus on the US and South East Asian Markets. Focal systems (India) Private Limited is a totally home grown company that turned to become a successful multinational company in the field of e-publishing (electronic publishing). A first generation entrepreneur, who was employed as a clerk in the local University, initially formed the company. The firm could capture export orders only because of the access to Internet and the TeX-user[1] group movement. The promoter was able to utilise his earlier expertise in related software use and the success of the firm highlights an interesting case of a small firm utilising Internet as a marketing medium successfully.

KRAN systems Private Limited is another locally owned company that has not had any major success in the export or domestic market. With the larger view of trying to gain skill and experience in the domestic market and thereby move up the value chain and undertake exports, the company has been focussing on the domestic market, especially the e-governance segment. Enter Technologies Private Limited is an ITES company housed in Technopark, engaged in medical transcription and web content creation. The company was started with the active involvement of a few local entrepreneurs, who were not originally associated with the IT sector and who wanted to utilise the opportunities in ITES highlighted by the Nasscom-McKinsey study report of 1999. Right from its inception, the company has had to face major difficulties in getting orders from abroad, in spite of making a franchisee agreement with an US firm, and has not been able to continue on successfully.

Indsoft was an IT solutions provider based in Technopark, which made huge losses in the last two years and had to be finally closed down. The company was trying to specialise in new technologies, but were not capable enough of getting adequate orders to sustain the function. The chief promoter was earlier running an oil mill and had diversified into software with a view to exploit the opportunities in the sector. The Kudumbasree IT unit

[1] The TeX Users Group (TUG) was founded in 1980 for educational and scientific purposes, to provide an organization for those who have an interest in systems for text typesetting and font design, and are users of TeX and Metafont typesetting system. The user group is active on www.tug.org

studied was purely catering to the data entry operations for many of the Government departments. The unit is able to do so successfully on account of their linkages with Government, low wage structure and the networking of such centres around the state.

4.2. Critical reasons for success and failure of software firms in Kerala

A detailed study of the firms revealed that there was a number of critical factors that determined the success or failure of the firms. A few of these factors have specific relation to the regional characteristics of the state as well. The major reasons include marketing related issues, promoter background, infrastructure issues and low levels of domestic demand.

The critical success factor for Nest lies essentially in the fact that the chief promoter is based in the US and that he is able to source adequate work for the local company. The initial success of the firm was on account of the strategic alliance that the local company had with its counterpart in the USA, which is also headed by the same chairman. This meant that a minimum quantity of orders was always flowing into the local company. This essentially allowed the company to sustain its operations and then slowly move up the value chain. The primary reason for the company being located in Kerala arises from the fact that the chief promoter belongs to the state. Though the decision seems to have very little to do with any of the characteristics of the region, it is important to note that the operations could progress to a higher level only because of the availability of international quality infrastructure in Technopark and the skilled human resources in the state.

The critical success factors of Sun Tech are a unique combination of the utilisation of the opportunities arising out of a new technology and the establishment of a proper marketing network. The chief promoter, who was earlier with the state run electronics development corporation, latched on to the opportunity of developing a billing system in the domestic market for the department of telecommunication, Government of India. Since the new technology of ICT was universal in standards, it offered the local player an opportunity to cater the same product to a global market. However, the marketing was not easy as the foreign firms were initially not convinced about the fact that such a product could be developed in this part of the world. Through its alliance with Logica,

Sun Tech expanded its clientele in Europe. Later many international and national firms approached the firm for billing solutions. The fact that the firm got converted into a private limited company in 1999 after infusing US$ 4 million from the German investor, Shroeder, also helped it to position itself as a global player.

It is interesting to note that the success of the company has had some relation to the specific regional characteristics of the state. The globally widespread *Malayalee* diaspora created the need for national and international telephony, which in turn lead to the proliferation of public call offices in the state. While the demand for a standardised billing solution was national, this particular scenario in the state acted as the basic pull for the development of the software.

The critical success factors for InApp arises from its use of *Free software*[2] and the fact that the firm was started by a group of technocrats who had software work experience in USA. In fact the idea of starting the firm originated on account of their working together. One of them is still based there, exclusively for undertaking marketing for the local firm. The company caters to the customised internet applications market and exports 75% of its services to USA. Apart from the fact that the promoters belong to the state, the other major reasons for locating the firm in the state include the availability of skilled manpower and the cost advantage of the state. However, unlike the factors like marketing arrangement and formal and informal networking, these regional strengths are not considered as the most critical factors that decide the success of the firm.

However in the case of Focal, the most important factor for its success lies in the fact that the firm has been able to utilise the skilled manpower in the state. There reliance on free software and utilisation of internet as a medium of marketing helped the company to reap rich dividends. The company made use of the institutionalised mechanism of internet based user groups for their marketing. In this context, it may specifically be

[2] The idea of Free Software comes from Stallman, M. Richard (www.stallman.org) and the Free Software Foundation (FSF), founded in 1985, dedicated to promoting computer users' right to use, study, copy, modify, and redistribute computer programs. Free software refers to four kinds of freedom for the users of the software: (i) the freedom to run the program, for any purpose (ii) the freedom to study how the program works, and adapt it to their needs. Access to the source code is a precondition for this (iii) the freedom to redistribute copies without any permissions and (iv) the freedom to improve the program, and release the improvements to the public.

noted that, in spite of the firm not having any links abroad, it was able to source work by exploiting the opportunities that the new technology of Internet provided. The type of activity that the firm undertakes, e-publishing, requires a level of skill which is higher than what is required for data entry mode of operations. The firm hence employs only graduate degree holders.

However, the lack of many local firms undertaking such niche activities points to the fact that while changes in technology has created specific advantages to a region like Kerala, lack of proper institutionalised mechanisms and dynamic entrepreneurial background has constrained the conversion of such opportunities into businesses.

One major requirement for small enterprises to move up the value chain and create necessary capabilities for export, is to actively participate in the domestic market. The over dominance of the public sector in the state, even in manufacturing, has resulted in a situation where the domestic demand is mostly on account of Government and its agencies. The lack of adequate domestic demand and the constraints in catering to the public sector due to the lack of proper institutionalised mechanisms has been the major reasons for the failure of KRAN. The constraints in catering to domestic demand and the lack of proper marketing arrangements abroad for its ITES kind of activity are the key reasons for the plight of Enter Technologies in Technopark.

These kinds of companies find it extremely difficult to cater to the domestic market since, most often, the work within government is provided to any one of the public sector units in the state. There is no proper framework that has been created within Government such that the e-governance activities could be channelised to the private sector. In fact, the present state policy of preferring public sector acts as an entry barrier for the private firms. The private sector industry in the state along with their capabilities in terms of software preparation, process re-engineering, quality mechanisms have been insulated from the ongoing e-governance activities. This condition seems to be detrimental for both the government and the local industry. Where as the local industry suffers from lack of domestic orders and possibilities of learning, Government fails to channelise the project management expertise and modern management methodologies into governance.

Interestingly, it is this kind of preference shown to government agencies that has been the primary reason for the success of Kudumbasree IT units in the state. The data entry operations for almost all the government departments are currently undertaken almost exclusively by the Kudumbasree units in the state.

The lack of appropriate experience in the sector has been the major reason for the death of Indsoft. The promoters neither had the technical background or access to the targeted export market. The company tried to enter a very competitive high spectrum-high technology market but did not have the adequate capabilities in terms of skills, resources and marketing channels for emerging as a successful player.

The one major factor that divides the successful firms from the others is their ability to have a strong marketing arrangement with the end user. This arrangement is most successful if the firm is able to have their own office close to the market. However, the case of Focal highlights the possibilities of an internet based arrangement. The not so successful and failure firms, invariably, have concentrated on producing a superior product or skill with the belief that this will give them an edge in the market. However, access and accessibility in the export market is more important in the case of software sales. While one could argue that this kind of problem might be confronted by smaller firms located anywhere in the country, it becomes a bigger problem for firms belonging to regions away from the major clusters.

Another important aspect that emerges as a critical factor is the background of the entrepreneurs and promoters in terms of their earlier association with this kind of industry. It is seen that entrepreneurs or promoters who have had some good exposure in the software industry, either within or outside India, are found to be operating most of the successful companies. Since software industry is a dynamic knowledge based industry, the skills of the promoter and their formal and informal networking is critical for the success of the firm. Non-Resident Keralites who have had good software industry exposure outside the state are leading the front running firms in the state.

4.3. The presence of Technopark

The perceived image about Kerala as a labour militant destination has long been a major bottleneck for investments into the state. Though the software sector has been insulated from labour militancy, the characteristics of the overall working environment were a cause of concern to many investors in this sector. Technopark provided a safe *island* for these investors and ensured that good quality international standard infrastructure is available for companies. The park brought about a major change in the work culture and value systems, as it was more or less isolated from the other activities in the state. While the cost of taking up space within Technopark is much higher than outside, the fact remains that it is still cheaper than any other park, with comparable facilities, in the country today.

Moreover, companies find other vital advantages in getting located inside the park. The overall ambience and excellent infrastructure of the park helps firms in attracting and convincing clients about the credibility of the firms and their capabilities in delivering the services. The very fact that a company is located within Technopark even helps firms in easily getting a visa for their vital foreign trips. Moreover, it was also observed that the employees also prefer to work from Technopark and have a pride in being associated with a Technopark company.

However, the higher cost of operating from Technopark acts as a barrier for smaller companies to move into Technopark and thereby exploit the advantages of being there. One could argue that it is those companies that have adequate resources that moves into the Technopark and this essentially is the major reason for the high incidence of success within Technopark, rather than the Technopark creating successful companies.

The companies within Technopark face the problem of being physically isolated from the city. This is a major problem for ITES companies which employ people in large numbers. The companies have now adopted a strategy of providing travelling facilities to all employees with a view to ensure proper timings and this has resulted in heavy overheads for these companies. Moreover, it takes about an hour to reach the park from the city. The situation is worse in case there are any major traffic bottlenecks on a

particular day. Hence there is a tendency for many of the successful ITES companies to move out of Technopark and base their operations closer to the city.

The positive externalities on account of such clustering of companies in Technopark on the smaller firms working outside, has been very limited and there is very little formal or informal networking between these firms. There is very little of outsourcing of work from Technopark companies to firms outside the park on account of the fear of quality related issues and also due to the fact that many times Technopark itself is at the tail end of outsourcing.

Technopark has, no doubts, been able to create a positive image about the state among investors. However, it seems that the progress made is not adequate enough, considering the fact that the park, which is the first software park in the country, does not house the software production divisions of even one firm from among the top twenty leading software exporters in India.

4.4. The advantages and disadvantages of being in Kerala

All the firms studied were equivocal about the fact that Kerala provides good quality human resources for the sector. One of the major reasons for companies like Nest, InApp and Focal to base their operations in Kerala was due to this fact. The success of Kudumbasree units highlights the potential of the state to tap the opportunities right up to the Panchayath level. However, the firms were also critical about the lowering quality of the technical human resource from the state. The Vice president of InApp believes that the state's focus on quantity rather than quality has lead to this situation.

The chief executive officer (CEO) of Focal, points out the there has been a high degree of dilution in the theoretical background of students and this apparently was on account of the higher focus given to computer usage associated with products rather than on concepts and ideas. This, he believes, has lead to a situation where students give very little focus on conceptual learning. Instead they learn some programming codes of software, which probably becomes obsolete by the time these people are available in the labour market. He highlights that the state should facilitate IT training in all streams of education rather than focussing on the creation of a pool of engineers alone. He points

out that opportunities are available in sectors like the US $40 billion e-publishing industry, which require IT trained ordinary graduates.

Successful companies like Nest and Sun Tech also believes in the strengths of the 'intelligent workforce' from the state. However, for smaller companies, locating the person with the right kind of skill sets is often difficult and the process of recruitment is always very laborious. This is more so in the field of ITES, where the requirements for soft skills like knowledge in English, communication skills, etc are important. However, these aren't the type of skills that ordinary graduates are provided during their course. According to the CEO of KRAN, the problem of quality has not really surfaced in the state yet, since the total number of people employed in the sector is low and this group belongs to the better quality personnel available in the state. He warns that as the employment in the sector increases, there will be a drastic reduction in the available quality of manpower. This, he believes, will have serious implications on the future flow of software investments into the state.

While the industry is happy that the human resource from the state is highly trainable, they are also worried about the fact that the state does not provide them readily employable human resources. One major state intervention in this sector is the creation of a centre of excellence in IT called the Indian Institute of Information Technology and Management-Kerala. The institute was started with a view to provide highly skilled people to the industry.

The fact remains that the state needs to rework on its human resources planning to come up with a more realistic plan of action, based on market realities and regional strengths. Major initiatives need to be taken to provide trained personnel in the ITES sector. Both the general education as well as the technical education streams needs to be streamlined with a view to introduce IT at all levels, so that it is viewed as a tool by all students irrespective of their area of study.

Another major advantage of operating from Kerala is the fact that the *fully burdened* cost of operation is lower than operating from most other competitive sites in the country. As the CEO of InApp points out, the earnings per hour in Technopark is the highest in India, compared to other parks offering similar facilities. All the successful companies studied

point out that, in spite of the possibility of moving to other destinations at various stages of their growth, they decided to stay back in Kerala on account of the cost advantages that the state offers.

However, it is pointed out that though cost is an important factor in the software sector, it is important to understand that the decision to locate a company from outside is dominated by the preference of its employees as well. Major software companies in the country often site the lack of a cosmopolitan culture in Trivandrum and the non-availability of Technopark kind of facility in Cochin as major reason for their not locating the firms in Kerala. The lack of social infrastructure, as required by the employees of software companies has been a major problem confronting companies based in Kerala, as well. Many of the middle level professionals are keen to be away from the state and prefer to be based in cities like Bangalore, Chennai, etc. as they find more opportunities and social advantages with those locations. This has created a problem for the successful companies to employ and retain middle level and higher-level professionals with in the state. However, attrition rate among the lower level programmers are very low in the state.

Moreover, ITES firms do not face this kind of problems. In fact, cost is the most vital criterion in this sector of the software industry. It is logical to conclude that a region rich in human resources and having an advantage in terms of cost is ideally suited to become a successful ITES destination. This could possibly start the cumulative process of agglomeration noted by Krugman[3]. This approach would, however, need a focussed plan of action by the state in terms of highlighting and further consolidating its strengths in this sector of the software industry.

The major disadvantages faced by software firms in Kerala, especially those that are concentrating on the export market are certain labour practices like strikes, *bandhs and harthals*[4] undertaken outside the industry but engulfing the whole state. These activities, with their locus of control away from the industry, limits the operations of firms in terms of timely delivery of services to a client outside and provides a bad image about the

[3] See Chapter 1 for the labour pooling model formulated by Krugman
[4] Bandhs and harthals are labour protest practices of paralysing all activities in the state in protest against some Government action.

place before visiting clients from abroad. This is true for companies based in Technopark and outside, though the isolation factor of Technopark has many times helped companies within to control the degree of damage. Such labour practices, which apparently does not directly stem out of a labour issue in the software sector, prevalent in the state continues to be a major constraint for serious investors to consider Kerala as a investment option. Firms like Nest, have in the recent past, even decided to relocate themselves to other parts of the country on account of such problems.

As discussed before, Kerala enjoys one of the best digital infrastructure in the country and this is true throughout the state. Though the other major software centres in the country do not have such infrastructure all over their state, they have ensured good net connectivity to their software parks. Hence the firms operating in these parks have access to excellent quality of net connectivity, which is a basic requirement in the software industry.

However, the availability of state wide digital connectivity does not ensure that the high end user firms get the same quality of service as their counterparts in the rest if the country. Quality of net connectivity, especially in terms of speed, has been a major constraint for the firms located in Kerala, especially for ITES firms. It is believed that with the commercialisation of the state of the art international gateway based in Cochin, this situation would improve.

4.5. The Gender dimension

It is generally seen that as the labour absorption capacity of a firm increases, the percentage of women employed in the firm also increases. While a firm employing about ten people may not have even a single female working in the firm, a firm with about fifty employees is most likely to have around forty percent female employees. In smaller firms, every single employee is assigned multiple tasks including programming, marketing, etc., which would involve extensive travel.

Due to the general social pressures on females prevailing in the region that constraints their wide spread travel, stay late night for finishing major export projects, etc., firms tend to prefer men to women. While the new technology in itself is often considered as

gender neutral, the ground realities are governed by strong social factors prevailing in a region.

While these factors are not different in the case of larger firms, a critical number of females in a firm help create a situation where they are able to collectively overcome some of the social pressures. The male counterpart invariably undertakes the marketing and allied travel activities. However, in the case of ITES companies, female participation rates exceed 50%. The CEO of Enter Technologies points out that females are better equipped to undertake repetitive work, the kind that is undertaken by ITES companies. In most of the firms, females leave their jobs mainly on account of marriage or because of pregnancy. The firms consider these situations as *nightmares* since they suddenly loose a trained employee. It is to be noted that most of the firms are not ready to provide statutory compensations for pregnant women.

On the other hand, it is interesting to note that the successful companies are trying to provide equal opportunities to both genders. However, the general outcry is that societal and parental pressures have interfered in the women employees' performance. It was also observed that the female participation at the higher decision making levels were very low and that the percentage of females allowed to undertake foreign trips for marketing or for undertaking projects were almost zero in almost all cases. It, however, has to be noted that observed biases against the female employees were usually due to social barriers and taboos rather than the lack of confidence by the firms upon their female employees. The firms point out that these barriers were stronger than those that their counterparts experience in other parts of the country.

4.6. The role of the state

Software firms expect the state to play an active role as a facultative rather than as a regulator. They expect the state to play the role of a catalyst in ensuring adequate flow of capital into the software sector in the state through appropriate promotional and policy instruments. The state also has a role in ensuring quality factor inputs and infrastructure for the sector. But the firms trying to exploit the domestic market like KRAN and Enter expects the state to play an active role in nurturing the local small industry, by deliberately channelising more work from within government to these units. The CEO of

InApp highlighted the importance of synergising the tourism potential in the state with the IT potential and the need for state establishing this link. Nest believes that the Government can play an important role in helping software industries just by investing more in IT based Government services and systems.

The general feeling among the companies in Technopark is that the state is already providing the required help in terms of infrastructure, pro-enterprise policies and incentives. The overall feeling is that the government has succeeded in creating basic infrastructure facilities especially for the export based firms but have failed to create appropriate institutional mechanisms for easier public private partnerships in e-governance. Moreover, the relevance of state financial institutions in this sector is also questioned by many of the firms. Indsoft Infotek considers that if the firm were suitable supported by its state financial institution, the company would have survived. While this claim is highly disputable, going by their track record and capabilities, one certainly finds that there are rigidities associated with the financing by state financial institution for a sector that is highly demanding and dynamic in nature.

4.7. Entrepreneur background and social capital

All the successful firms, invariably, had a highly motivated entrepreneur or chief promoter who has had vital work experience abroad or had opportunities to have access to larger social network in the state. There are very few cases of people who have started their operations immediately after their college and made it big in the sector. This is mainly on account of two important characteristics of the software market. If the firm is concentrating on the export market, the chief promoter needs to have a clear understanding about the demand conditions abroad and should be able to utilise the contacts and networks that he has created during his work experience there. This is important since almost all export from the state is project based and hence the firm does not have any 'sample pieces' that can be exhibited abroad for getting orders. This informal networking with a foreign land coupled with formal arrangements to back up the activity seems to be critical for the success of exporting firms. The background of the entrepreneur is hence critical in getting and executing orders.

Even in the case of Sun Tech, the whole possibility of creating software solutions could be tapped by the promoter only because of the fact that he was earlier employed in a government electronics development agency and thus had access to the decision makers as well as R&D facilities. Moreover, unlike the other small players in the domestic market, the ties that he had with his parent organisation added credibility in the initial stages of market development.

In the domestic market also formal and informal arrangements and networks seems to be important. The possibility of having access to officers in Government is vital in getting orders from Government. It was seen that the successful firms operating in the domestic market had chief promoters who had good access to higher-level officers, mostly on account of their social contact and networking. This shouldn't be considered as a rent seeking arrangement, but as a need arising out of the 'weightless' characteristic of the technology. As stated above, unlike physical goods, customised software solutions cannot be demonstrated before getting an order and hence the client needs to have some faith in the developer prior to giving an order. Hence, every other thing remaining the same, the social capital of the promoter or firm becomes the deciding factor.

4.8. Concluding remarks

It is with some caution that general conclusions can be drawn from the case studies since each firms covered in the study have specific factors that determine their performance. However, they also generally reflect the underlying processes and the impact of the regional characteristics on their operations.

One major aspect that differentiates the successful firms from the not so successful or the failure firms is the marketing strategy employed by the firms. The importance of this aspect emerged during the field survey and this was further investigated during the case studies. Successful firms have started a marketing office close to the client site and this office canvasses and gets orders. These orders are then passed on to the local company for execution. On the other hand the other companies wait for orders or utilise a non-reliable networking abroad for sourcing of orders. They generally end up either not getting orders or that the intermediate arrangement swallows a good portion of the profits. The one exception was the case of Focal systems, where an institutionalised user

group mechanism was utilised by the entrepreneur to market his services successfully. It may however be noted that marketing problems are confronted by firms all over India (Heeks, 1998), including places like Bangalore and hence this cannot be attributed to a region specific constraint. The problem becomes more apparent in the case of Kerala because of the relatively smaller size of the firms.

The promoter background was critical for success in the export and domestic market. It may be noted that it is not exclusively the technical competence that helps an entrepreneur to succeed, but his level of interactions, contacts and networking in the client site. It is equally important that the promoters have a good technical background to assimilate the dynamic changes in the sector and to understand the needs of the customers.

The non-Technopark firms face serious infrastructure bottlenecks in terms of connectivity, quality of power, etc. The issue of associated physical and social infrastructure are major constraints for the industry within the park as well. The absence of regular and convenient national and international flight connectivity from Thiruvananthapuram and Kochi has been a major issue that has hampered the activities of export-oriented units in the state. The state also faces the disadvantage of not having any of its cities with metropolitan social infrastructure, which is an important criterion for sourcing good talent into the state. While Technopark has world-class physical infrastructure, a focus on creating necessary social infrastructure required for sustaining such an industry also needs to be created. The state may need to initially intervene in terms of promoting such infrastructure.

One major advantage that the state has is the possibility of having lower cost of operations from the state. In this regard, it may be noted that, while cost is an important aspect that is considered before an industry is located in a region, it in itself may not prove attractive for firms to move into the state. Other factors like retaining the labour force, social and physical infrastructure, availability of trained human resources, etc. would also be considered before location decisions are finalised. Moreover, the industry is more aware of the opportunity cost and hence may not consider the cost values directly. However, the emergence of the cost sensitive ITES sector might prove to be an ideal sector for the state to focus on.

The state has often been highlighting the availability of trained human resources as the biggest advantage for the software industry in the state. Apart from the fact that human resource is highly mobile and hence moves towards regions of better career prospects, it follows from the study that the quality of the human resource in the state is much below the expectation of the industry. While, the problem has not boiled over at this stage, owing to the limited number of people employed in the sector currently, further growth and development of the software industry in the state would be constrained by the lack of availability of trained good quality human resources. Moreover, considering the prospects of the state in the ITES sector, it needs to seriously review its strategy of creating more engineering colleges and focus on creating good quality domain experts in various fields, who are additionally equipped to use ICT in their filed of activity. The state needs to focus on facilitating the increase in the quantum and quality of manpower for the ITES sector.

Kerala has been perceived as a labour militant state, which has limited the flow of industrial investment into the state (Subrahmanian, K. K. and Azeez Abdul, E. (2000). It is seen from the study that the software industry is not affected by any labour problems. However, certain general labour strikes, outside the purview of the industry, and other practices that force the entire state to a halt has affected the export oriented software activity. Firms have pointed out instances when export orders were cancelled and when the visiting client was upset about the situation leading to denial of orders. But, on the other hand, there are instances of firms not providing appropriate labour conditions. However, since software industry has continued to be labour demand driven, these have not yet become major issues.

The women's participation in the software industry is quite high and there are possibilities of increased participation with the emergence of the ITES sector. One needs to, however, acknowledge the fact that women are present more in the low value adding sectors of the industry and that their representation in the higher management is minuscule. Moreover, firms are on the look out for young girls and almost always sever their relation with them either at the time of marriage or during pregnancy. Maternity benefits are seldom given to the women in this industry.

Some of the cases clearly reveal that the regional characteristics have had some kind of association with the overall performance of these firms. The state needs to take a conscious decision to participate the local industry in the ongoing e-governance projects in the state. The region possesses certain competitive strengths in terms of its ICT infrastructure and its earlier intervention in terms of creating a world-class infrastructure in Technopark, which has been the major reason for the clustering of a number of successful companies in the state. Equally important are input factors like high quality of human resources and social capital. The state, now, needs to take these interventions to the next logical level to really tap the potential of the industry.

Chapter 5

Summary and Conclusion

5.1. Summary of findings

The present study aimed at evaluating the problems and prospects of the Software industry in Kerala in the background of the software scenario in the country and the larger argument that ICT could act as an enabler of economic development. It is seen that ICT does offer immense potential for both developed and developing countries to utilse its power in various sectors of their economy.

But numerous factors influence the ability of regions to utilise ICT. The extent and speed of social and economic development, including political stability, physical infrastructure, basic literacy and basic healthcare are pre-requisites for the successful development and diffusion of ICT. Detailed analysis of experience around the world reveals ample evidence that, used in the right way and for the right purposes, ICT can have a dramatic impact on achieving specific social and economic development goals as well as play a key role in broader regional development strategies. The real benefits lie not in the provision of technology per se, but rather in its application to create powerful social and economic networks by dramatically improving communication and the exchange of information. It is also critical that the technology be employed with a view to address vital regional issues including employment problem, women empowerment and the larger economic development of the region.

It is evident that there is a *digital divide* across nations and within nations based on economic capabilities, gender, etc. Considering the heavy distortions of this nature, one would come to the conclusion that there is strong need for the state to intervene in this sector especially if it is used as a strategy for the development of state-regions in a federal set up. It may however be noted that the kind of interventions would differ from region to region and would also differ for developing the supply side and demand side of ICT. India has been able to tap some of the opportunities in the software and services sector of ICT.

5.1.1. The Indian software industry

The emergence of a developing country like India as a significant player in the software market has attracted a lot of attention from development literature. The growth of exports of software from India at over 50% compound annual rate over the past decade has led policy makers within the country to view it as an engine of growth, a source of employment and foreign exchange, among other favourable effects. Although the entry of multinational enterprises in the mid 1980s helped to demonstrate the potential that India had as a base of software outsourcing, it is seen that the Indian development is largely driven by indigenous entrepreneurship, talent and resources.

The emerging trends in the Indian software industry shows that the there is a conscious move away from low value adding coding and programming to export of high end consulting and packaged software, indicating that the industry has come of age and is ready to play a dominant role in the global software market. Though the recent US slowdown has toned down the assumptions underlying the projections made by the National Task force and Nasscom McKinsey study, it is expected that the industry would continue its growth in the medium term, though at lower rates than that of the past few years.

5.1.2. The Kerala software industry

The Kerala software industry is characterised by its small size, in terms of capital investment and employment. While, the relatively larger firms are able to make appropriate marketing arrangements with their clients abroad, the smaller firms find it extremely difficult to operate in the market. Their worries are further increased by the fact that the domestic demand is low and that the e-governance projects by the government are almost always given to the public sector firms.

While the state has an advantage with respect to the human resource availability, the quality of the available manpower is far from desirable. This could soon act as a major constraint for further development of the industry in the state. The state also has a disadvantage in terms of the non-availability of metropolitan social infrastructure, which is critical for the industry to retain their human resources. Moreover, the state also lacks

associated infrastructure including convenient and frequent international and national flight connectivity, centres of technical and management excellence, etc. which are considered vital by the industry.

These physical realities coupled with the negative labour related perceptions of the state have been instrumental in limiting the agglomeration of software industries in the state. It may specifically be noted here that this situation is, in spite of the earlier interventions taken by the state in the sector including the creation of Keltron, Technopark, investment policy, etc.

5.2. Key state interventions required in the sector

The real potential of ICT for a region like Kerala arises from the successful development of ICT industries and its use in all sectors of the economy. This would necessitate a very active state intervention in terms of facilitating industrial development and undertaking diffusion strategies aimed at rapid diffusion across all sectors in the economy. In the case of the software industry, a direct intervention, like, the state running an ICT industry does not seem to be logical or even necessary. Here, the state needs to play the role of a facilitator for private investment and also the role to monitor in terms of labour regulations. The government of Kerala has already come out with an investment promotion policy for the ICT industry (See *www.keralaitmission.org*), which basically aims at providing quality input factors at reasonable cost and providing financial and other incentives to firms investing in the state.

5.2.1. Specific state interventions

In order to reap the full potential of ICT, the state needs to have critical interventions through or in all the following areas. These include (i) facilitation policy (ii) infrastructure (iii) Human capacity building (iv) enterprise promotion (v) content generation and other applications.

A well-defined and transparent policy is essential for promoting fair and open competition and for promoting the regional capabilities. However, the state has to also make a time-bound plan to ensure that local firms are initially given an advantage in

respect of awarding e-governance projects. This would, over the long run, create necessary capabilities in the local industries to compete with the major players outside the state. It should also aim to further strengthen the institutional capacity to implement and enforce policies.

The state needs to further strengthen the core ICT network infrastructure with a view to achieving easy access to the net for both business activities as well as the people in general. It also needs to invest in strategically focused capacity to support high development priorities including developed readymade infrastructure for software firms. The state has a lead role in building a critical mass of knowledge workers, increasing technical skills among users and strengthening the local entrepreneurial and managerial capabilities.

The state needs to play the role of a facilitator with a view to attract more and more software firms into the region. It needs to also encourage enterprises through improving access to financial capital, facilitating access to global and local markets, enforcing appropriate tax and property rights regimes, enabling efficient business processes and stimulating domestic demand for ICT. The state also needs to begin the process of providing demand-driven information, which is relevant to the needs and conditions experienced by local people.

5.3. Prospects for Kerala in the software industry

Kerala enjoys a lot of advantages as far as the software industry is concerned, mainly on account of its socio-digital infrastructure. However, as discussed under the agglomeration arguments, it does not have the ambience of a modern urban social infrastructure or an abundant supply of technically qualified and employable human resource, both of which are critically required by the high-end software industry. The associated infrastructure like international flight connectivity and perceived problems like labour militancy have limited the inflow of investment into this sector. However, with the abundant supply of human resources from all the educational institutions in the state, Kerala is well equipped to play a dominant role in the ITES sector.

ITES sector does not require the kind of high-end urban setting like the software activity. Moreover, the state is very cost competitive and this is the most important factor in the ITES sector. Apart from the value and income generation aspects associated with ITES, it also opens up the sector for employment from a diverse spectrum of the society and will not be restricted to urban elites or be constrained by the number of technically qualified people that the state can supply.

As discussed in the literature on agglomeration, what is required for the state at present is to attract a few large companies in the field of ITES into the state. Instead of starting a cumulative process described by Krugman through a historic accident, the state needs to take a lead role in attracting this critical number of companies into the state. This would help more and more of this kind of firms moving into the state to tap the ITES possibilities of the region. The state needs to have a focused strategy on the five critical factors described above, with a specific view to attract and encourage ITES operations in the state.

The state also needs to undertake both direct and indirect interventions for this purpose. The state needs to tap the submarine optic fibre connectivity available in the state and make the high-speed connectivity available in select parks through out the state. The investments for setting up the parks as well as the communication infrastructure could be sourced from the private sector through appropriate models like joint ventures, BOOT (Built Own Operate and Transfer) or BOO (Built Operate and Transfer). The approach taken by the state to offer rights of way to private players to lay fibre optic cables throughout the state is a commendable task.

The state also needs to facilitate the creation of an adequate pool of trained human resources for the ITES industry. This would call for drastic and immediate steps to alter the syllabuses followed for all degree level programmes. Steps need to be taken to make IT education part of the general education stream right from the school level. Moreover, language and communication skills and other soft skills essential for the ITES industry need to be imparted.

The state already has an IT policy aimed specifically at the software and ITES firms. The policy is generally based on an approach of promoting the state on the basis of incentives

and subsidies. While this approach, made on account of the increased competition among the Indian states, may be required, one needs to undertake a detailed cost – benefit analysis to ascertain the usability of such policy instruments. Moreover, the policy is silent on the frameworks for government –business interactions for outsourcing of work from the Government. But, appropriate labor laws have been incorporated for the smooth functioning of the firms and for ensuring good industrial relations in the work place. The Government has been taking a series of steps aimed strengthening the institutional capacities for proper policy implementation and dynamic changes in strategies.

The e-governance strategies and other diffusion strategies followed by the government do not seem to benefit the local firms. It may specifically be noted that a buoyant domestic market and establishment of capabilities in the domestic market are critical for any ITES firms to enter the export market. Moreover, this would also bring down the over dependence of such firms on a very volatile export market. Hence, there is a need to create appropriate frameworks to ensure that firms based in the state benefit from the diffusion of ICT. It is also important that the state strongly goes ahead with its diffusion programme and extent it to all other sectors in the economy.

The state intervention should be such that a combination of small and large firms is created in the sector. Strategies in terms of infrastructure, policy, etc needs to take care of this aspect. While the gender equality is far from reality in this sector as well, compared to many other alternatives, this sector provides a good opportunity for the educated women in the state to become economically capable and socially empowered.

To conclude, the study shows that a region like Kerala has a lot to benefit out of the opportunities provided by ICT, both from its supply side as well as its demand side. However, apart from having certain initial endowments, the region also needs to create necessary capacity and capabilities for succeeding in utilising the potential of ICT. Moreover, it also has to identify suitable areas of operation in the supply side, based on the strengths of the region. The study brings out the fact that the state has reasonably good prospects to emerge as a leading ITES hub in the country. It may, however, be noted that the state needs to intervene directly and indirectly, especially during the initial stages, to induce the cumulative process of agglomeration of such firms.

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Location of software industry - an analytical framework.

Consider a situation where there are a number of firms from the same industry. Let each firm be represented by a revenue function in which labour is the only argument, and for the sake of the example, suppose that the function is quadratic, with additive firm-specific shocks to the marginal revenue product of labour:

$$R_i = \alpha + (\beta + \varepsilon_i) L_i - (\gamma/2) L_i^2. \quad \text{(E.1)}$$

Ignore the possibility that firms will act as oligopsonists in the labour market, each firm will set the marginal revenue product of labour equal to the wage rate, as shown in E2.

$$\omega = \beta + \varepsilon_i - \gamma L_i. \quad \text{(E.2)}$$

This implies a labour demand function from each firm:

$$L_i = \frac{\beta + \varepsilon_i - \omega}{\gamma}. \quad \text{(E.3)}$$

Within the location, we assume that the labour market clears: Where *n* is the number of firms,

$$\sum_{i=1}^{n} Li = L, \quad \text{(E.4)}$$

The wage rate will depend on the number of workers, the number of firms, and on the economic shocks experienced by the individual firms:

$$\omega = \beta - \frac{\gamma L}{n} + \frac{1}{n} \Sigma_i \varepsilon_i \quad \text{(E.5)}$$

Let us now assume that the shocks experienced by the firms are uncorrelated, with a variance σ^2. Then we could show that the expected wage rate depends only on the ratio of the labour force to the number of firms:

$$E\omega = \beta - \frac{\gamma L}{n}. \quad \text{(E.6)}$$

The variance of the expected wage depends on the number of firms:

$$\text{var}(\omega) = \frac{\sigma^2}{n} \tag{E.7}$$

The covariance of the wage with firm-specific shocks also depends on the number of firms:

$$\text{cov}(\omega, \varepsilon_1) = \frac{\sigma^2}{n} \tag{E.8}$$

The profits of a firm are its revenue less its wage costs:

$$\pi_i = R_i - \omega L_i. \tag{E.9}$$

From E.1, E.5, and E.9, we can deduce the expression for expected profits,

$$E\pi = \alpha + \frac{1}{\gamma}\left[\frac{L}{n}\right]^2 + \frac{1}{2}\,\frac{n-1}{n}\,\sigma^2. \tag{E.10}$$

The expressions for expected wages and expected profits are now functions of the number of firms and workers in a given location.

Suppose that there are two locations, 1 and 2, with both firms and workers free to choose in which location to settle. Of the n total number of firms, n_1 locates in 1 and n_2 in 2. Similarly, of the L workers, L_1 locate in 1, L_2 in 2.

The resultant possible equilibrium configurations are the following: (i) an even split of both firms and workers. This is shown in figure 1.1 by the point labelled 1. This, however, turns out to be an unstable equilibrium. To understand the reason, we draw in the loci for which firms and workers respectively are indifferent between the two locations. The locus of worker indifference *WW* corresponds to a line with slope *L/n*, since expected wages depend only on the ratio of firms to work.

For firms, the difference between the profits of a firm in location 1 and that in location 2 is

$$\pi_1 - \pi_2 = \frac{1}{\gamma}\left[\left[\frac{L_1}{n_1}\right]^2 - \left[\frac{L_2}{n_2}\right]^2\right] + \tfrac{1}{2}\sigma^2\left[\frac{n_1-1}{n_1} - \frac{n_2-1}{n_2}\right] \tag{E.11}$$

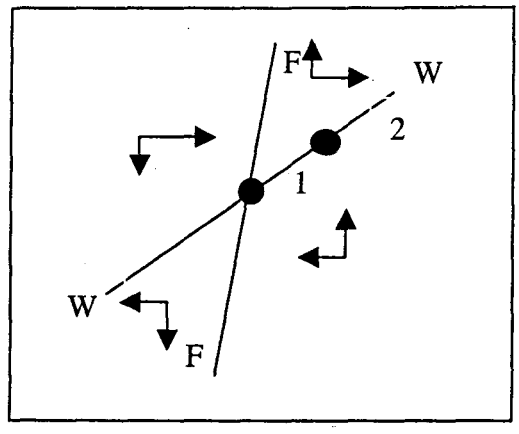
In the vicinity of $n_1 = n_2$, $L_1 = L_2$, the effects of reallocating firms and workers to location 1 are

$$\frac{d(\pi_1 - \pi_2)}{dL_1} = \frac{4}{\gamma}\frac{L}{n^2} > 0. \qquad \text{(E.12)}$$

and

$$\frac{d(\pi_1 - \pi_2)}{dn_1} = -\frac{4}{\gamma}\frac{L^2}{n^3} - (1/2)\sigma^2\frac{1}{n_1^2} < 0. \qquad \text{(E.13)}$$

Figure A1.1 Labour pooling and location of firms



It is apparent that the locus $\pi_1 - \pi_2$, *FF* in the figure, is upward sloping. It is also obvious from equations (E.12) and (E.13) that it is steeper than *WW*. Consider point 2 in figure 1.1. At that point the *ratio* of firms to workers is the same in both locations, but location 1 has more of both. From (E.10) it is therefore apparent that firms are more profitable in location 1. So *FF* must lie above *WW* at that point.

Now assume that workers move towards the location that offers higher expected wages and that firms move toward the location that offers higher expected profits. The dynamics of the model are then indicated by the arrows. Point 1 is unstable and the system is driven to a corner, with all firms and workers concentrated in one location or the other.

Annexure 2

IT Software and Services Industry in Kerala

An analysis of Problems and Prospects

M.Phil 2000-2002
Centre for Development Studies
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Dear Sir/Madam,

I am pursuing my M.Phil (Applied Economics) from the Centre for Development Studies (CDS), Trivandrum. As part of the programme, I am undertaking a dissertation study on the IT Software and services industry in Kerala. I request you to kindly answer the following questions prepared for the purpose of the study. Your help will go a long way in understanding the characteristics of the industry in the state.

I would like to assure you that the data collected will be used only for pooled analysis and that no part of your answers will be quoted on an individual basis. The following questions would take about 20 to 30 minutes of your time. Let me at the very beginning thank you for the interest shown and for agreeing to spend your valuable time.

Yours sincerely,
G. R. Kiran

1. Name of the firm :
2. Name of respondent & Designation :
3. E-mail of respondent :
4. Year in which the firm was founded/ (Started functioning in Kerala) :
5. Please indicate the background of the **CHIEF PROMOTER** of your firm (tick all relevant)

☐ Technocrat ☐ First generation Entrepreneur ☐ NRI based in ____

☐ Worked in PSUs ☐ Worked in MNCs ☐ Studied in IIT/IISc

☐ Shifted from family business ☐ Earlier running other businesses ☐ Others(Please Specify)

Kindly tell us a few details about the structure of your organisation.

7. Your firm is a *(tick relevant)*

☐ Proprietary concern ☐ Partnership firm ☐ Private Ltd. Company

☐ Subsidiary of MNC ☐ Multinational Company ☐ Public Ltd Company

☐ Self help group ☐ Joint Venture ☐ Others (Please Specify)

8. What was your turnover in respective years (figures in lakhs)?

SECTOR		1998-99	1999-2000	2000-2001
⇒ Exports	Off-shore			
	On-site			
⇒ Domestic				

9. Please indicate the **NET WORTH** (promoters contribution and reserves) and **NET PROFIT** (Profit after tax depreciation and interest) of your firm in the following years?

Rs. in lakhs

	1998-99	1999-2000	2000-2001
Net Worth			
Term Loan			
Net Profit			

10. What are your firm's major sources of funds (in %)?

Source of Capital		At startup in %	Currently (%)
Share capital/Promoters contribution	NRI		
	Local		
Venture Capital			
Family/Friends			
KSIDC/State Finance Institution			
Bank finance/Term Loan Finance			
Lease Finance			
Others (Please specify)_____			

11. What percentage of your turnover was from software, ITES and other activities?

Turnover on account of	1998-99	1999-2000	2000-2001
Software projects/products			
ITES activities			
Other activities			
Total	**100 %**	**100 %**	**100 %**

12. Which countries/regions do you export to?

Country/Region	% of EXPORTS in 2000 – 2001
• USA/Canada	
• Europe	
• CIS	
• Australia	
• Japan	
• South East Asia	
• Middle East	
• Other Asian countries	
• Rest of the World	
Total	**100%**

13. Who are your major **DOMESTIC** buyers/buying sectors?

☐ IT companies___%	☐ Education sector_____%	☐ Government (Kerala)____%
☐ Local Bodies___%	☐ Government (India) _____%	☐ Other Governments ____%
☐ Tourism sector__%	☐ Subcontract assignments___%	☐ SSI manufacturing sector___%
☐ Construction ___%	☐ Shops & Establishments ___%	☐ Others (Please Specify)__/__%

14. Please select the software services undertaken by your company (Tick all applicable):

A Software services (Business areas)	Domestic	Export
• Banking		
• Medical		
• Ware house, Retail & Distribution		
• Multimedia and Entertainment		
• Education		
• Travel and tourism		
• Manufacturing		
• Government		
• Transport		
• Construction		
• Other _____		

B Software services (Service type)	Domestic	Export
• Customized software		
• Packaged Software		
• Internet Related		
- Using HTML, JavaScript, Page Hosting		
- Using Java, Active X or CGI Programs		
- Any other		
• Data Processing /Transcription/Billing services, etc.		
• Systems software (Network or OS related firmware etc)		
• Design and Engineering software (CAD /CAM)		
• Communication software		
• Euro currency conversion related services		
• Software conversion /Porting services		
• Maintenance of Legacy systems		
• Other _____		

15. If you have introduced any branded packaged software products in the last 3 years, please specify the following

⇒ Product name _____

⇒ Sector _____

16. Please indicate **nature of alliances your company has with foreign companies**, if any, for software development and its associated activities with **country** and **year of entering into alliance**.

Name of foreign partner	Location	Year	Type of alliance				
			Subsidiary	Joint venture	Tech. transfer agreement	Marketing distribution agreement	Strategic alliance

17. What was your firm's **number of employees** in the following functions (as on these days)?

Function	31.12.1999	31.12.2000	31.12.2001
• Research & Development			
• Sales & Marketing			
• Professional Services (on-site)			
• Professional Services (offshore)			
• Data entry/ITES activities			
• Maintenance and support for services			
• Administration & Finance			
• Others			
Total			

18. What percentage (number) of employees have **degrees/diplomas** from

Institutions	Percentage/Number
• Engineering Colleges	
• Other University Degrees	
• National institutes (IITs/ IISc, RECs, etc.)	
• Foreign Universities	
• Private/Public Training institutions (NIIT, Aptech, etc.,)	

19. What is your company's annual gross payroll (including salary, wages, commissions and bonuses)?

☐ Less than 1 lakh ☐ 1-10 lakhs ☐ 10-25 lakh

☐ 25-50 lakh ☐ 50 lakh – 1 crore ☐ 1 – 5 crores

☐ 5 – 10 crores ☐ 10 – 50 crores ☐ Greater than 50 crores

20. Please indicate the major methods of recruitment (please rank in order of the action taken)

☐ Internal Informal channel ☐ External Informal channel ☐ Campus recruitments

☐ Through an agency ☐ Voluntary Bio-data submission ☐ Through advertisements

☐ Walk-in-interviews ☐ Others (Please specify)_____

21. Please indicate the gross average **MONTHLY** salaries for the following categories

(Rs.)

Activity	Qualification/ Level	Years of experience					
		< 1	1 - 2	2 –3	3 - 4	4 - 6	> 6
Software Programming	Post Graduate or above in Engineering						
	Engineering						
	Other Degrees						
	Others						
ITES activities	Highly skill						
	Medium skill						
	Low skill						

22. How often does a technical employee in your company get training?

Training	Number of times in a year
In-house sessions	
External sessions	

23. What is the total number of technical employees who have left your firm in the last one year (30-12-2000 to 30-12-2001)

----------nos.

24. What are the major components training of a technical employee?

Type of training	Percentage
• Technical Training	
• Behavioral Training	
• Communication Training	
• Language Training	
• Others	
Total	***100 %***

25. Kindly provide us the following details regarding your **women employees**

a. Total women employees as percentage of total employees in your firm

Activity	Women (%)
Software Programming	
ITES activities	
Other activities	
Total	**100%**

b. Percentage of women in the first 10 % of the personnel in the hierarchy starting with CEO/ MD. _____%

Opportunities & Threats

26. In your opinion, where are your primary competitors located (top 3)?

Country	Rank
• India	
• Israel	
• Ireland	
• USA	
• China	
• Singapore	
• Philippines	
• Eastern Europe	
• Russia	
• Others (Please specify)_____	

27. Please **RANK** the **SEVEN MOST IMPORTANT** problems that your firm faces

Problem	In Domestic Market	In Exporting
• Manpower shortage /skills		
• Employee attrition		
• Physical infrastructure (power, water, transport)		
• Commercial infrastructure (E.g. Internet connectivity)		
• Finance / Capital		
• Marketing Access		
• Investor perceptions/apprehensions about Kerala		
• Social Infrastructure in the state		
• Lack of domestic computerization initiatives		
• Preference given by Government to PSUs		
• Labour problem (internal to your company)		
• General labour issues affecting the state		
• Labour productivity		
• Bureaucratic hurdles		
• Lack of government support/responsiveness		
• Unattractive incentive/subsidy schemes		
• Quality certification		
• Visas		
• Tariffs and other barriers		
• Other Problems (Please specify) _____		
_____		

28. What are your three major strategic advantages? (Please rank them)

☐ Low cost ☐ High quality ☐ Marketing

☐ Human resources ☐ Satisfied clients ☐ Locational advantage (Please specify)

29. What are the major ways in which projects originate? (Please rank the following)

Origination of Project	Rank
• Through Customer's initiative	
• Through IT Consultants / Third Party recommendations	
• Through an Open Bid	
• Marketing office outside	
• Marketing efforts primarily from Kerala	
• Sub-contracting mechanism	
• Others (Please specify)	

30. Due to the present changes in the software market, have you been considering the following options, either as a diversification strategy or as additional measures to your on-going activities? (***Please tick the relevant***)

Options	Not considering	Slightly seriously	Very seriously
• Emphasis on in house R & D			
• Moving up the value chain			
• Moving to ITES			
• Moving to software program			
• Introduction of package production			
• Trapping new export market			
• Tapping new domestic market			
• Hardware manufacturing			
• Switching to a location outside Kerala			

31. In your opinion, what is the effort taken by the company in undertaking R & D activities in your area of activity? (in a scale of 10)

0	1	2	3	4	5	6	7	8	9	10

0 - No R& D effort
10 - R&D is the priority of the firm

32. Quality certificates acquired or assessments done or by your company:

Certification / Assessment	Y	Year first obtained	Applied for certification (Y/N)
ISO 9001 or related series			
SEI CMM Level _____			
Other (Please state)			

33. What were the major reasons for basing your firm in Kerala? (Please rank the top **FIVE REASONS**)

☐ Cost advantage	☐ Employable human resources	☐ Chief Promoter belongs to Kerala
☐ Technopark	☐ Incentives & Subsidies	☐ Government support
☐ Physical infrastructure	☐ Social infrastructure	☐ Others (Please Specify in detail)

34. What are your specific suggestions for making Kerala as attractive destination for software development? (**FIVE MOST IMPORTANT** SUGGESTIONS)

1	
2	
3	
4	
5	

35. What are the specific future plans of your organization?

THANK YOU