INTRODUCTION

For centuries, India has been a dreamland for navigators to reach in. Trade with India had been frenzy for the rulers of different landscapes. The traces of that great interest in trade with India could be seen in many historical and religious texts. For centuries, India has been the epicenter of global trade. However, of late, the profile of India as the economic resource centre has undergone considerable change: It has been started viewing India as an impoverished nation. This image continued to exist till the 1990s. While India was still suffering from abject poverty, epidemic, grave social inequalities, massive unemployment and destructive political upheavals and uncertainties, a latent revolution has been underway in India’s technological landscape. India has now been recognized the emerging capital of global software industry. The Indian software industry and export have been projected as one, which could address all of India’s chronic development ills.

India, the world’s largest democracy and home to over one billion people, is quietly but quickly emerging as a leader in the field of software engineering. India, one of the poorest countries in the world, better known internationally for its uncompetitive industries, has come a long way with its high growth software industry. India’s competitiveness and productivity/effectiveness are not recognized by the nations. However, having recognized its mastery over software production, policy makers
started pinning a lot of hope on the capability and potential of this sector in taking India to the front stage of rapid development.

The competitiveness in international trade has, nowadays, acquired a lot of strategic importance. The most powerful nation is not necessarily the nation with the most potent military backup but a nation with economic muscle. Here comes the strategic importance of international trade. India is more known for its software exports, than the domestic trade. The people from all walks of life are now recognizing the importance of software export and its competitiveness, for facing challenges from other parts of the world by which it can address India’s balance of payment deficits, technological backwardness, retarded growth of the economy and unemployment.

1.1 RELEVANCE OF THE STUDY

In this study, the researcher attempts to go into the greater depths of India’s software industry domain. Software industry in India concentrates its efforts more on exports. India is becoming a major software exporter. This is a country which offers cost-effectiveness, great quality, high reliability, rapid delivery and, above all, state-of-the-art technologies in software development. The profile of the software development and application by Indian vendors attracted the clients from all parts of the world. It is, in this way, significant to understand the future prospects of this sector.

It is emphasized in many theses that one of India’s advantages in software business is its large pool of technically skilled human resources which is available at low cost. However, many developing nations with
sufficiently large pool of human resources are striving to make their mark on the map of global software industry. Hence, India may not be able to boast off her competitive advantage in software industry for long. Studying this aspect is important in terms of the sustainability of this industry and export.

Many have pinned their hope in the transformation capability of this sector on the Indian economy. However, much of it depends on how this sector, especially the exports enables itself to innovate and face competition in this highly dynamic society. Hence the study on export competitiveness deserves merit.

Its export driven model now commands the world's attention for skilled professionals and offers hope to many developing countries which are struggling to cope with a hyper-competitive post-WTO global economy. How India stands in this kind of a battleground is considered to be crucial.

This is a kind of topic, which attracts the attention of policy makers and the government. The software industry and its earning capacity for foreign exchange have definitely a larger bearing on India's economic future. However, studies of serious outlook and a systematic approach are hardly seen before the government in order to take vital policy decisions and measures.

This study was motivated by the need to understand factors that guide the software exports and competitiveness, both positively and negatively. The influence of one factor or another upon the export and export competitiveness is to be understood in great depth which is
necessary to find out the industry’s sustainability. It is also important because the strategic loopholes could be identified so that the remedial measures shall be advocated.

A large number of problems or factors, which curtail the prospect of Indian software industry and export, have been spelt through a number of studies. The devastating capabilities of some of them are much bigger than the others. This study aims to identify such problems.

1.2 HISTORY

Technological revolutions, in most circumstances, have far-reaching effects. For some, it may be a life and death problem. But for most countries, it brings out a number of opportunities. Some of these opportunities are unexpected. One such opportunity was availed when India has recognized that it can derive many advantages in computer and software industry. India’s success at software has led to speculation about whether other developing countries can emulate its example, as well as whether this constitutes a competitive challenge to software industries in the developed world. In this scenario, it is thoughtful to understand how this nation has been making its voyage in software industry in the context of rough weathers and severe bottlenecks.

India has had a software policy since 1970. Prior to 1984, rigid policy restrictions ensured that there was virtually no software industry. Between 1984 and 1990, the restrictions were eased and Indian firms entered the global market by providing low-cost programming services. After 1990, pro-
active promotion of the industry, along with economy-wide policy liberalization, led to rapid growth in exports. The nature of exports also changed from providing programming services at client sites, to providing offshore services from India for turnkey projects demanding a wider range of capabilities. (Parthasarathy, 2004).

Before 1984, the policy initiatives were very restrictive in nature. In 1977, the Indian government refused to allow more than 50 per cent ownership by foreigners of any company operating in the nation. IBM refused to sell majority ownership of its Indian operations, and was thus forced to leave India. Later, after 1984, the then Prime Minister Rajiv Gandhi changed government policies to encourage an indigenous microcomputer industry (Singhal and Rogers, 2001). Imports were liberalized, and international standards were followed by Indian computer manufacturers so that their products could compete more effectively in the global market place.

During the initial phase of computer software industry in India, many constraints had to be addressed by itself. These constraints include access to finance and skills, a low level of research and development, access to telecommunications and other infrastructure, access to markets and information about markets, and low demand and high piracy in the domestic market. The firms have had difficulty in various types of capital. Software is moderately capital intensive and very highly technology intensive (Cleetus, 1984). Small firms have been particularly affected by the problems of
access to finance since, unlike the largest companies, they do not have access to capital from multinationals or the big sized Indian firms.

Another bottleneck experienced by the firms has been the lack of high skilled manpower. The relative lack of skilled labour is the most serious constraint to the Indian software industry's development (Singhal, 1988, Tandon et al, 1990 and Schwaré, 1992). Although there has been a shortage of all type of labor, it has been the shortage of the higher-skill levels – programme designers, system analysts, project managers – that has particularly affected this industry.

Software companies, especially exporters, faced a number of telecommunications problems, including the scarcity of actual telecommunications links, delay in obtaining such links, poor transmission quality, and the high cost of installation and use. As a result, overall growth of Indian software exports was stunted, and offshore software development viewed by many foreign clients as unacceptably problematic (Heeks, 1996).

There has been another major problem in the form of market and marketing issues. The ability to monitor and interpret market and technical changes and spot opportunities and shift strategy is vital but beyond the capacity of most individual firms (Sridharan, 1989). This is one of the major reasons behind the low level of software package exports from India, though lack of market information also makes it difficult for software service companies to locate clients or assess potential partners, and for all companies to keep up with the latest software production technology.
The Department of Electronics (DoE) was the body responsible for policy making for the computer industry. But later on, Computer Policy of 1984 eased the availability of microcomputers and facilitated software exports by encouraging on-site service provision. (Parthasarathy, 2004). The 1986 Software Policy encouraged foreign investment in the industry and access to technological development overseas, by allowing easy imports of the latest software and software tools.

While the 1984 and 1986 policies mainly removed hurdles before the industry, positive promotion came in 1990 when the DOE initiated the Software Technology Park (STP) scheme. The Software Technology Parks of India (STPIs) provide data communication facilities using which firms can provide offshore services from India instead of being limited to on-site provision.

In 1988, the industry also formed its own trade body, the National Association of Software and Services Companies (NASSCOM) to promote its interests. When it was formed, NASSCOM had 38 members who accounted for 65 percent of the industry's revenues. A decade later, it had 464 members, accounting for 95 percent of industry's revenues (Parthasarathy, 2004).

The infrastructure in IT took off gradually following the Prime Minister's 1998 IT Task Force and its 108 recommendations, two-thirds of which saw the light of the day. And series of policy changes, and the 2001 Convergence Act which spoke little of convergence but did replace the 1885 Telegraph Act, with its separate rules for voice and data. And the
convergence of the telecom and IT ministries happened in 2001. All that it needed was for the government to step out of the way (Roy, 2002).

In November 2004, the government announced its Broadband Policy and permitted use of 2.4 GHz in outdoor locations, (Dataquest, 2005 a). From Rs. 3,455 crore turnover in 1992-93, the Indian IT industry grew to mammoth size of Rs. 1, 24,122 crore turnovers in 2004-05. The exports alone grew from a mere Rs. 931 crore in 1992-93 to Rs. 81,096 crore in 2004-05. (Dataquest, 2005 b)

Under this subtitle we have seen the emergence of software industry in this nation, the major bottlenecks, which had been experienced by this sector, and the major turning points, which boosted this industry in becoming a globally competitive software industry in the world today.

1.3 LITERATURE REVIEW

Software industry shall be said comparatively to be a young industry, if not infant, especially when compared with industries like mining, textiles etc. It has to be specified that this industry is even younger than computer industry. In erstwhile times, software has been clubbed with hardware and/or electronics and so software industry has been a constituent of the larger spectrum of electronics and hardware industry. As this being the case, authoritative literature on India’s software industry and its competitiveness is scarce and deficient in number, if not nil.

Kaplinsky (1987) had examined the impact of information technology on the economy of developing nations. He clarified that information
technology is one of the most crucial technologies influencing economic growth in developing countries. Bhatnagar (1992) had also opined on similar lines. A World Bank study (1993) specified that software had become the 'lifeblood' of business, industry and government. Narasimham (1984) in his work had specified about the need for developing nations embracing local software industry. Fialkowski (1990) and Schware (1987) expressed the necessity for developing countries to awake to build its own software industries to keep momentum of the economic growth.

"In developing countries interest in both the production and the use of software is becoming more intense" (Schware, 1990). Two writers (Schware 1987, Correa, 1990) talked about policy guidelines on software. But authors like Heeks (1996) criticizes that their policy guidelines were not set within the larger industrial policy framework.

Kohli (1991) expressed that there had been an overwhelming preoccupation with software exports to the detriment of a viable domestic software industry. Raman (1985) stated that despite the growth of package sales and data entry services, Indian software exports have been dominated by export of software services, in the form of custom software work rather than export of software products, in the form of packages.

There were many studies, which looked into the break-up of India's software exports ie; destination of software exports. Lakha (1990) asserted that the export market was regionally concentrated, with a heavy reliance upon the U.S.
Size matters when it comes to the software firms. Schware (1989) points out that the main advantage of small firms' presence in the industry is its ability to act quickly in order to exploit market niches. Cooper (1983), Saldanha (1983) and Sen (1995) expresses that there was a need for a focus on the medium and large firms, at least in exports, because they offer greater certainty of growth, they take advantage of scale of economies and bargain strength that small companies do not have, and they face fewer entry barriers.

Some studies pointed that staff turnover was a major problem for software companies. Mukhi and Chellam (1988) expressed that in the world of software exports, since there are no tangible assets being exported, the loss of men or brainpower can be the biggest loss that computer companies face.

There are studies, which talked about the problem of brain drain faced by India. Sivakumar (1990) noted that India's total brain drain losses between 1985 and 1990 estimated to have cost the country as much as US $13 bn.

Lanvin (1991) expressed that one of the areas in which competition is likely to be fiercer than anywhere else is software market. D'Costa (2000) clarified that broad economic reforms are compelling Indian business to respond to increased competition.

Low staff cost is found to be a major advantage, which India has. Moore (1992) and Nicholas (1994) examined that salary costs in the UK
were four to five times higher than those in India, while those in the US were six to eight times higher. Software salaries in Russia were roughly twice as high and those in Singapore were about three times higher (Meadows, 1994; Zachary, 1995).

The US market dominates Indian software exports partly because it is by far the world’s largest software market, constituting around half of all software sales in the late 1980s and 1990s, and partly because ‘American information technology and financial services companies have moved much more quickly than their European counterparts to take advantage of offshore programming (Tilley, 1990).

There are studies about the productivity, competitiveness and job opportunities as directed by Indian software industry. Mehta and Reilly (1992) and Crabb (1995) specified that it seemed likely that the gap between demand and supply of software could continue to grow both in the West and India. Regarding skills requirements, Cane (1987) and Hemnes and Di Paolo (1995) noted that the main skills bottleneck for the Indian software industry is not a shortage of programmers to write programs but a shortage of quality analysts able to decide what a business was all about and how best to represent it in computing terms.

Issac, Rajendran and Anantharaman (2003) have concluded in their study that quality has gained acceptance as a key factor that helps organizations to achieve success and competitive edge in the global market. The said study confirmed that the quality certified firms (inclusive of ISO 9000 certified and CMM highly rated firms) have better product attributes
(PAs) and return on quality (ROQ) than the non-certified firms. It has also been observed that there appears to be no difference between non-certified firms and ISO certified firms, whereas the CMM highly rated firms are better than non-certified firms and ISO certified firms with respect to both the performance indicators. Corbett et al. (1998) told that quality management has been reckoned as the prime mover for enhanced business performance. Sun (2000) endorsed that strategic management of quality and human resources is significantly correlated with performance improvement. Jorgensen (1999) stated that software quality can be indirectly measured and/or predicted with the help of characteristics like maintainability, usability, portability, reusability etc.

Ahmad et al. (1992) have expressed that the decrease in the number of local packages and that, mainly because of imports, 'local players have lost a major chunk of the domestic market and more Indian software vendors are now dealing in foreign products'.

There is literature on the role of government policy on software industry. The researcher could go through Page (1987). The author felt that government policy has not been decisive in guiding collaboration decisions. Dicken (1992) asserted that the actions of nation states form the most important element of the environment within which transnational corporations operate.

Singhal (1988) and Tandon et al. (1990) opined that the single most important input to the software production process is skilled labour, but
equally that the relative lack of such skilled labour is the most serious constraint to the Indian software industry’s development.

Many argue that newly industrializing economies would be in danger of losing their competitive edge based on labour (Ernst and O’Connor, 1989; Hurtado, 1985 and Porter, 1990). There are already signs that multinational corporations are moving their offshore operations, which were profitable in some developing countries mainly because of the relatively low cost of both unskilled and skilled labour back to home country as automation makes it possible to reduce cost even more. This means that in the future, developing economies will not be able to rely solely on cheap labour and intermediate technologies for their economic growth, as did Newly Industrialized Countries (NIC).

D’Costa (2004) discussed about the Indian software industry in the global division of labour. He delineated three forms of decoupling of the software industry in India. Those are

a) Decoupling the software industry from the larger hardware sector.

b) Disconnecting the industry from the domestic market, and

c) The specialized division of software into services and products.

He argued for urgent steps to extricate the software industry from its low-end trajectory. He reiterated the need for the resolution of the three disconnections by leveraging the domestic economy for export competitiveness and balanced home development.
Sridharan (2004) studied the recent evolution and future trajectory of the Indian software industry. He cautioned software firms continually reinvent themselves or incrementally adapt to challenges, both of which are essential for them.

Dorfman (1987) put forward the argument that appropriation of technological benefits via rapid moves down the learning curve and gains lead-time over rivals is a hallmark of an entrepreneurial technological regime.

Brunner (1995) has had a thoughtful and explorative study on the details of technological change which happened in India's computer industry. He went on to discuss the reasons why economies like India will, in future, have to close the technology gap in microelectronics and communications technologies in order to improve their performance and increase their industrial competitiveness.

Parthasarathy and Joseph (2004) have studied about the innovation under export orientation. They claimed that there appeared to have been hardly any attempt towards enhancing the innovative capability of the firms to enable them to move up the software value chain.

Avnimelech and Teubal (2004) analyzed the Indian software industry from an Israeli perspective. They analyzed a number of aspects such as Israel’s high tech sector and cluster, innovation and technology policy, three Indian IT companies, the prospects for Indian IT and possible policy implications.
Krishnan and Prabhu (2004) studied software product development in India. The researcher analyzed six cases with particular references. Singhal and Rogers (2001) discussed the evolution of technology and technology industry including information, communication and software industry 'from bullock carts to cyber marts'. They analyzed India's communication revolution, the public broadcasting revolution, the private television revolution, rising technopolises, the telecommunications revolution and the computer and Internet revolution.

Kattuman and Iyer (2001) discussed about a number of implications of India's software industry. They also talked about the phenomenon of decoupling of software export markets from the domestic market.

Saxenian (2004) studied about the transnational networks and regional development in Taiwan, China and India. The author made clear the important jargons like technical communities, industrial decentralization etc. He referred China as a case of reversing brain drain.

Basant and Chandra (2004) studied capability building and inter-organization linkages in the Indian IT industry. Authors say that convergence of technologies is creating newer opportunities for inter-firm alliances. Kanter, Kao and Wiersema (1997) argue that there is a need for an organizational climate which helps in overall business performance. Wheelwright and Clark (1992) argued a development strategy that chooses the right set of projects and helps integrate strategic planning with R & D strategy.
Ojha and Krishna (2004) analyzed on the subject of originative innovation and entrepreneurship in the software industry in India. They strongly argued for the promotion of entrepreneurship in the Indian software industry. Bhatnagar and Dixit (2004) studies stages in multiple innovations in software firms. It could be understood that different stages are involved in multiple innovations in software industry.

The researcher also surveyed a very popular and useful journal 'Dataquest'. The researcher could go through and analyze all issues of 'Dataquest' right from January 2002. Some important references from the said journal could be quoted in other chapters. On account of the problem of abundance, no references of 'Data Quest' could be detailed under the title 'Literature Review'.

It is also to be clarified that appropriate references available about the literature are quoted in other chapters.

1.4 STATEMENT OF THE PROBLEM

India is being emulated as an example for the success strategy in software development and exports. Many scholars as well as industry experts claim that the sector can answer to many of the problems of chronic ills of India's backwardness. India's software industry is hailed as one of the globally competitive software industries in the world. India has been given number one rank in terms of attractiveness as shown by many attractiveness indices (AT Kearney, 2004)
In this study, the researcher made an attempt to endeavour a comprehensive look at the competitiveness of India's software industry. Indian software and services industry and exports are bestowed with a number of merits and positive strengths. India is cited as a hub of one of the world's largest and most talented human resources, a large number of English speaking skilled labour which, in turn, is a natural advantage which is in consonance with the needs of industries of the developed world, and of course, a comparatively early preparedness of this country in the field of hardware and software expertise. Even when this being the case, it is finding it difficult to answer to a number of fundamental questions aroused by the realities of today and concerns about the future.

Is India really worthy of being at the front stage of the global attractiveness of software industry? Are the preparedness, strengths and policy orientations of future really help to sustain with at least the present scale of competitiveness? Could Indian industry outsmart the extent of competition posed by players like Ireland and Israel? Is the level of physical discrepancy in turnover between domestic software sales and exports helping the cause of competitiveness? What are the problems of software industry and exports, which are to be addressed with urgency and a time scale? What is the degree or extent of impact each factors have upon the sectoral performance? This study tries to seek answer to all the above questions.

India and its software sector enjoy plenty of natural advantages. It is also to be categorically specified that it is devoid of many of the strengths
the developed world has. In this background, the problem is whether India is competitive enough to face challenges from other dominant players as well as contingencies of future? This study discusses how India places itself in the trajectory of global competitiveness of software industry and exports.

1.5 OBJECTIVES

The following are the major objectives:

1. To model the growth pattern of exports and domestic sales of software and services of India.

2. To find out the factors influencing the growth pattern of software industry in India.

3. To compare the growth pattern of software industry of India with respect to that of Ireland and Israel.

4. To find out the criticality of various problems faced by software industry and export in India.

5. To model the variables of competitiveness of emerging software producing nations.

1.6 HYPOTHESES

Based on an extensive and detailed survey of literature and key interactions made with the think-tank in software industry and academics, six different hypotheses were formulated on the following lines:
1. The difference in rate of growth in turnover between the domestic software sales and software export is more or less constant.

2. The export competitiveness of software industry in India is not governed by any specific factor/factors.

3. The three emerging software exporting nations- India, Israel, and Ireland – follow almost similar pattern in their export turnover and competitiveness.

4. The guiding variables of software industry in India are independent irrespective of the size/turnover of software firms.

5. The governing criteria, which guide the software export and its competitiveness, are independent in nature.

6. In terms of competitiveness, India’s position in global software industry domain is neither lucrative nor lukewarm.

1.7 METHODOLOGY

Both primary and secondary data have been used in the study. No specific geographical delimitation is made into effect in this study on account of the peculiarity of the topic. Since the export competitiveness is the primary area of interest, the data of both India and international economies have been taken into account. The major sources of secondary data are international reports, websites of national and international software export promotional agencies like National Association of Software and Services Companies (NASSCOM), research and commercial
establishments and reputed journals like Dataquest. When developing models on software success guiding factors, primary data have been resorted to. Both face-to-face interview and online survey based on a structured questionnaire were employed to collect primary data. In order to fix the sampling size a pilot study has been carried out. No specific study sampling procedure could be employed because of the peculiar nature of the industry and professionals. In order to make sure that all the different sections of the population are duly represented, a large sample size has been taken. Total sample size 1089.

1.8 TOOLS USED IN THE STUDY.

The data collected through primary and secondary sources were scrutinized and statistical software viz; AMOS (Analysis of Moment Structures), SPSS (Statistical Package for Social Sciences) and E Views (Econometric Views) were used for analysis. The following tools have been employed for the purpose of analyzing the data and at arriving at inferences.

- Different Simple Linear Regression Models were used to model India's software export and domestic sales as well as the export of Israel and Ireland.

- Panel Auto Regression Analysis has been applied to model and compare the software export performance of India, Israel and Ireland in combination.

- Analysis of Variance (ANOVA) has been used to identify the impact of different factors upon software industry and export.
Multi-Dimensional Scaling (MDS) is used to identify similarity/dissimilarity among different factors which guide software export.

Structural Equation Model (SEM) has been used to measure the relationships between eleven factors, which guide software export.

Canonical Correlation is used to find the extent of correlation between different variables of competitiveness.

Principal Component Analysis (PCA) has been used to ascertain the position of India in the competitiveness ladder.

1.9 LIMITATIONS OF THE STUDY.

A standard sampling procedure could not be adopted due to the specific nature of the industry.

Secondary data could be more resorted to rather than primary data because of the nature of the study.

Since software industry and export are an emerging and dynamic field of economic activity and that the rate of change is so rapid, the relevance of individual factors may change over time.

1.10 CHAPTER SCHEME

The study is presented in Seven Chapters. Chapter 1 describes the relevance of the study, statement of the problem, history, literature review, objectives, hypotheses, methodology and limitations of the study. Chapter 2 elucidates low profile domestic software. Chapter 3 compares the export
performance of India, Israel and Ireland on a panel auto regressive model. Chapter 4 reviews factor impact and firm size based on primary data. Chapter 5 deals with the building of a software export guiding factors model. Chapter 6 reviews the positioning of different countries on attractiveness scale and builds India's position in competitiveness ranking. Chapter 7 presents the findings of the study, suggestions for improvement and conclusion.