ELECTRONICS INDUSTRY IN INDIA AND ITS GROWTH POTENTIAL IN HARYANA AND PUNJAB

A Thesis

Submitted in Fulfilment of the Requirements

For the Award of the Degree of

DOCTOR OF PHILOSOPHY

Investigator

RAJ KUMAR SANGWAN

SCHOOL OF MANAGEMENT

THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY

(DEEMED UNIVERSITY)

PATIALA – 147 004 (INDIA)

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IPR Declaration

I, Raj Kumar Sangwan have authored the thesis entitled "**Electronics Industry in India and its growth potential in Haryana and Punjab**" under the supervision of Dr. D.S.Bawa, Professor, School of Management and Dean (Academic Affairs) and submitted the same to Thapar Institute of Engineering and Technology (TIET) for the award of Ph.D. for the academic year 2004-05 and also submitted an electronic copy of the said thesis to TIET for archiving in the Library.

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CERTIFICATE

This is to certify that the work presented in this thesis entitled "**ELECTRONICS INDUSTRY IN INDIA AND ITS GROWTH POTENTIAL IN HARYANA AND PUNJAB**", by Mr. Raj Kumar Sangwan in fulfilment of the requirement for the award of the degree of Ph.D. in the School of Management, Thapar Institute of Engineering and Technology (Deemed University), Patiala, is an authentic record of candidate's own work carried out during a period from 4th February 1997 to 17th April 2003 at this Institute under my supervision.

I further certify that the thesis endeavors to make original contribution to knowledge in the field of Electronics and Information Technology Industry and the matter presented in this thesis has not been submitted for the award of any other degree in any University.

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RAJ KUMAR SANGWAN

Patiala.
April 18, 2003.

ABSTRACT

India is facing regional imbalance in the Electronics and Information Technology industrial sector. The states of Haryana and Punjab have been identified as low growth states with just 1.5% and 4.7% share respectively in national electronics production in the year 1994 in comparison with the high growth states of Karnataka with 18.8% and Uttar Pradesh with 18.2% share placed at first and second rank in electronics production in India the same year.

The following are the major objectives of the present study:

1. To Study the government policies and present level of growth and development of electronics and IT industry in India,
2. To compare state policies, initiatives and growth and development of this industry in the states of Punjab, Haryana, Karnataka and U.P., and
3. To suggest suitable strategies for development of electronics and IT industry in the states of Punjab and Haryana.

As the study is more Macro-analytical, all past and present quantitative and qualitative information was collected and analysis is based on primary as well as secondary data. Primary data collected for the present study was restricted to sample states viz. Punjab, Haryana, Karnataka and Uttar Pradesh. Selection of the sample was purposive and based on the judgment of experts in the field of electronics and software.

The time series data was duly classified for the proposed period. Simple statistical techniques involving use of scatter line diagram, histogram, simple and compound growth rate and wherever required fitting of curve were used for drawing inferences. The primary data was classified, tabulated, analysed and inferences were drawn in line with objective of the study.

Historical developments in the sector, both at International and national level and India's contribution in global electronics and pre and post liberalisation phases of development of this industry in India were critically examined. Performance of the sector during various five-year plans and achievements against targets fixed for the plans have been analyzed. Further,

growth in each of the seven segments of electronics and IT industry at national level has been critically examined to arrive at specific conclusions.

The electronics and IT policies of the four states have been critically examined and explained in length. Initiatives at state level by government as well as Industry efforts in regards to establishment of specific infrastructural facilities for the electronics and IT sector based on the parameters namely sector specific R&D and technological up-gradation, adequacy of bandwidth for software exporters, adequacy of sector specific industrial complexes and working office space, availability of specific technical skill base, financial and marketing support and availability of quality electric power and general industry requirements have been critically examined. Conclusions from primary data and views of the experts of the field have been critically analysed and supplemented to arrive at specific findings. Based on these findings, certain specific observations have been concluded in the form of recommendations for accelerating the growth potential of the electronics and I.T. industry in the states of Punjab and Haryana.

The study concluded that Punjab has the lowest growth rate in all segments of electronics production. The rate of growth was found to be less than the national growth in all the segments of electronics industry. Haryana on the other side had impressive growth in all segments. It is not only higher than Punjab but also higher of all the four states. In view of above findings, it is suggested that Haryana should make efforts to sustain its present growth in electronics and IT sector whereas Punjab needs to develop strategies that give enough impetus to industry till it becomes self-sustaining. It is recommended that the states should play the role of the facilitator, not that of a producer.

Punjab state government should take measures to save existing sick or underperformed units as its short-term policy and promote services sector where manpower availability finds an advantage. IT enabled services should be identified as the focus industry. As a long-term policy, the state should consolidate to make larger viable units and enter international market with a large competitive base of technical manpower in services sector. The states should show high commitment, a friendly supportive attitude for attracting entrepreneurs/corporate in this industry.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AGR	Annual Growth Rate
AMU	Aligarh Muslim University
BHU	Banaras Hindu University
CAD	Computer Aided Design
CAGR	Compound Annual Growth Rate
CEPL	Consumer Electronics (Punjab) limited
Clik	Consortium of Electronics Industries of Karnataka
CSI	Computer Society of India
DBID	Data Bank and Information Division
DDP	Development Discussion Paper
DIT	Department of Information Technology (Government of India)
DoE	Department of Electronics (Government of India)
DTA	Domestic Tariff Area
ECP	Electronics Corporation of Punjab
EFY	Electronics For You
EHTP	Electronics Hardware Technology Park
ELCINA	Electronic Components Industries Association
ELTOP	Electronics Township of Punjab
EOU	Export Oriented Unit
EP	Export Performance
ESC	Electronics and Computer Software Export Promotion Council (Ministry of Commerce, Government of India)
ESPL	Electronic Systems Punjab limited
EXIM Policy	Export Import Policy
FERA	Foreign Exchange Regulation Act
FDI	Foreign Direct Investment
FOB	Freight on Board
GDP	Gross Development Product

GoP	Government of Punjab
GoH	Government of Haryana
GoUP	Government of Uttar Pradesh
GoK	Government of Karnataka
HARTRON	Haryana State Electronics Development Corporation Limited
HBTI	Hercort Buttler Technological Institute
HFC	Haryana Financial Corporation
HSIDC	Haryana State Industrial Development Corporation Limited
HUDA	Haryana Urban Development Authority
IDF	Infrastructure Development Fund
IIIT	Indian Institute of Information Technology
IPAG	Information, Planning and Analysis Group
IPLC	International Private Leased Circuit
ISP	Internet Services Provider
IT	Information technology
ITES	Information Technology Enabled Services
JNU	Jawahar Lal Nehru University
KEONICS	Karnataka State Electronics Development Corporation Limited
MAIT	Manufacturers Association of Information Technology
MRTP Act	Monopolistic and Restrictive Trade Practices Act
NASSCOM	National Association of Software and Services Companies
NEPZ	Noida Export Promotion Zone (Ministry of Commerce, Government of India)
NFEP	Net Foreign Exchange Earning in Percentage
NOIDA	New Okhla Industrial Development Authority
PABX	Private Automatic Branch exchange
PBMEL	Punjab Bio-medical Equipments Limited
PCL	Punjab Communications Limited
PEOSL	Punjab Electro-optics Systems Limited
PFC	Punjab Financial Corporation
PICTC	Punjab Information and Communication Technology Corporation Limited

PPPL	Punjab Power Packs Limited
PRL	Punjab Recorders Limited
PSEDPCL	Punjab State Electronics Development and Production Corporation Limited
PSIDC	Punjab State Industrial Development Corporation Limited
PTU	Punjab Technical University
PUNCOM	Punjab Communications Limited
PUNWIRE	Punjab Wireless Limited
PVCF	Punjab Venture Capital Fund
SDP	State Domestic Product
SEDC	State Electronics Development Corporation
SEEPZ	Santa Cruz Electronics Export Processing Zone
SEZ	Special Economic Zone
STP	Software Technology Park
STPI	Software Technology Park of India
TCS	Tata Consultancy Services
TP	Technical Paper
UPTRON	Uttar Pradesh Electronics Corporation Limited
VLSI	Very Large Integrated Chip
VSNL	Videsh Sanchar Nigam Limited

CONTENTS

CHAPTER - 1

INTRODUCTION

The twentieth century has witnessed the explosive growth and technological breakthrough in the Electronics Industry throughout the world over. The worldwide electronics scenario has undergone a transformation in the last two decades. It has now acquired the status of an all-pervasive industry because of its varied applications in capital and consumer markets. Electronics provides a forceful leverage to the socio-economic and technological development of human society. Electronics has significantly influenced the cost structure, quality and productivity standards of most other Industries. The impact of technological innovations has reduced costs and increased equipment performance resulting in exponentially increasing demand. This has led to veritable explosion of new products and processes. The chip technology that has revolutionized the industry is on its way towards a total or near total substitution of conventional electro-mechanical products and processes.

These developments are fast taking place even in India. In the international context, the Indian electronics industry is tiny in size. However, Indian IT industry has made its unique place in software development at world level. The Department of Information Technology, Government of India consider that one rupee invested in this sector has the capacity to double every two years through the benefit of higher productivity in all other sectors through automated equipment, instrumentation and computer control systems. Electronics and Information Technology industry has the propensity to increase the overall growth rate to a higher level, and hence this industry was given a special thrust during national Ninth Plan (1997-2002).

1.1 CHARACTERISTICS OF ELECTRONICS INDUSTRY

The characteristics of the electronics industry as described by earlier experts working in this field are as under (Sandhoo and Sarnot, 1997):

a) Low capital intensity

b) Low requirement of energy
c) High employment generation per unit of capital
d) Fast declining costs,
e) Fast pace of technological innovations
f) High R&D expenditure
g) Highly non-polluting
h) Global Markets.

In addition to above, Chip fabrication has also been recognized as one of the important characteristic world over. Number of jobs per Rs.10 million investment in 1989-90 was highest in electronics sector recording it to be 146, employment ratio (DoE,1992).

For a developing economy like India with low per capita income, scarcity of capital and high unemployment, electronics offers an appropriate technology choice due to its specific characteristics as mentioned above. Recognizing advantages out of its specific characteristics, the Japanese planners developed the electronics Industry in the sixties and seventies. Presently, Japan poses a stiff commercial and technological challenge to both United States and Europe. South Korea and Taiwan have followed the Japanese example and developed electronics industry to their full advantage.

1.2 DRIVING TECHNOLOGIES OF THE ELECTRONICS INDUSTRY

Today, world over it is a well established fact that the following are the key driving technologies (Sandhoo and Sarnot, 1997) in the electronics sector:

a) Information Technology
b) Microelectronics
c) Opto-electronics
d) Display Technologies
e) Surface Mount devices & assembly technology
f) Signal processing
g) Networks and Software

Apart from above, Chip fabrication has also been recognized as one of the important driving technology world over.

1.3. INTERNATIONAL ELECTRONICS SCENARIO

1.3.1 Production Trend

The electronics Industry accounts for a large percentage of national GNP and represents a growing proportion of the world's production. With only about US $ 20 millions electronics production in early 1920, the global electronics production passed through various milestones, US $ 735 billion in 1992, US $ 977 billion in 1995-96, US $ 1202 billion in 1998-99 reaching to US $ 1376 billion in 2000-01 (Table 1.1 and Figure 1.1 gives trend in global electronics and software production and India's share therein). It registered a compound growth rate of 7.1% from 1995-96 to 2000-01. During the same period, India's electronics grew at 4.3% and its percentage share in world production decreased from 0.55% in 1995-96 to 0.48% in 2000-01. The world electronics industry is projected to grow to US$ 6050 billion in the year 2015. The innovations in the electronic components design, manufacturing and their packaging formats, especially in microelectronics, opto-electronics display and surface mount devices have been a major factor contributing to the growth in electronics industry.

Table 1.1 Global Trend in Electronics and Software Production and India's Share therein.

(Value in US$ billion)

Production	**95-96**	**96-97**	**97-98**	**98-99**	**99-00**	**00-01**	**CAGR (%)**
World Electronics	977.00	1050.00	1124.00	1202.00	1286.00	1376.00	**7.1%**
India's Electronics	5.40	5.70	5.89	5.85	6.43	6.67	**4.3%**
India's share in global electronics production(%)	**0.55**	**0.54**	**0.52**	**0.49**	**0.50**	**0.48**	**-2.7%)**
World Software	298.00	350.00	403.00	463.00	532.00	612.00	**15.5%**
India's Software	1.20	1.77	2.80	4.40	5.72	8.04	**46.3%**
India's share in global software production (%)	**0.40**	**0.51**	**0.70**	**0.95**	**1.08**	**1.31**	26.8%

Source : ESC Statistical Year Book, 2000-01.

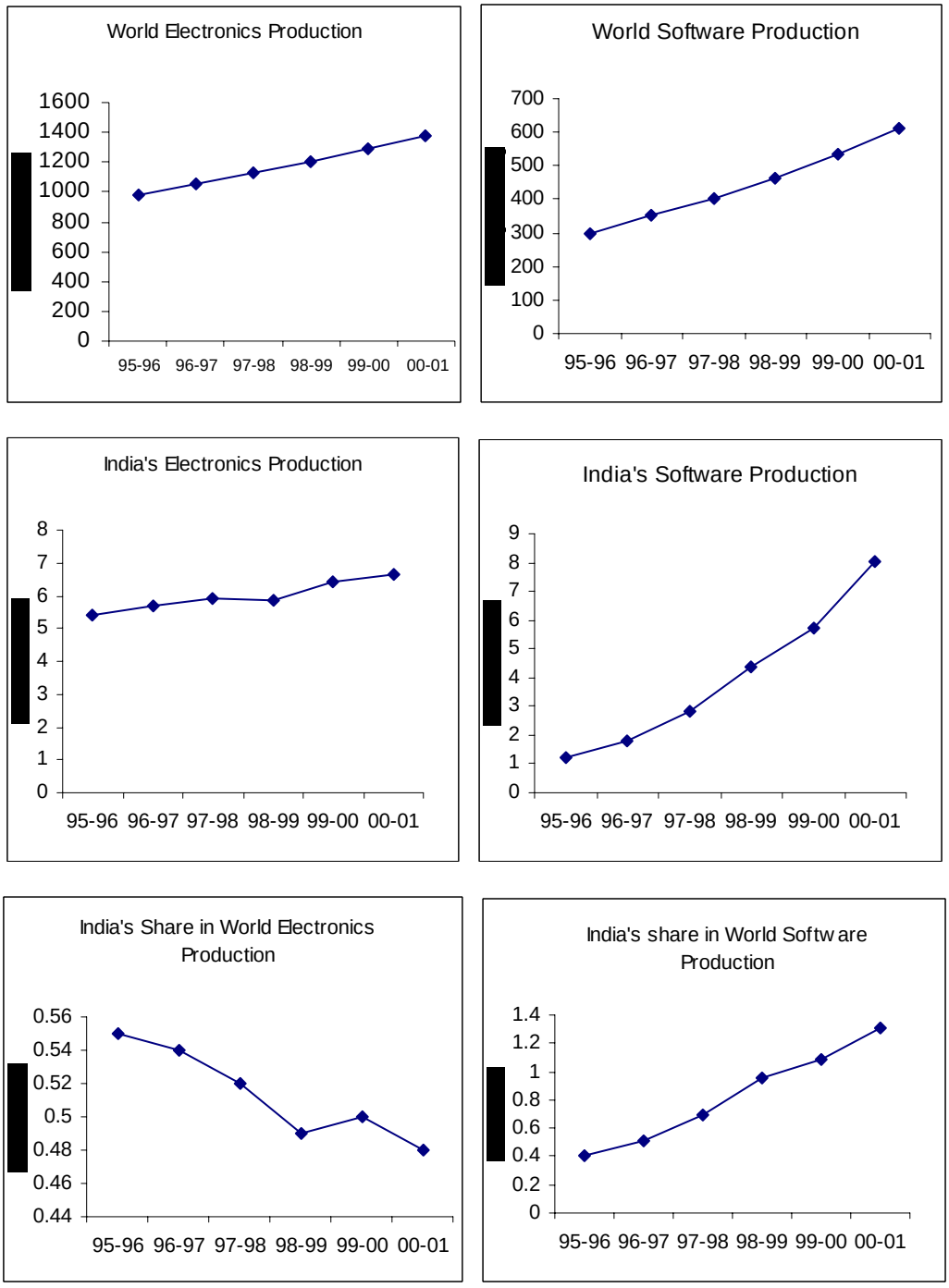


Figure 1.1 Global Trend in Electronics & Software Production and India's Share Therein

The Indian software industry recorded a CAGR of 46.3% from 1995-96 to 2000-01 as against 15.5% growth in global software industry. Percentage share of India's software in world software production has shown a sharp increase from 0.40% in 1995-96 to 1.31% in 2000-01.

As per Reed Electronics Research, USA and Japan continue to command top positions in electronics production since 1992. USA has registered a growth rate of 5.9% during 1999 and Japan 4%.

The electronics industry accounts for nearly 11% of the US GDP and 10% of all US manufacturing jobs. As per study by Endless Frontier, USA (www.worldusa.com), (5-7-2000), the electronics industry is also one of the fastest growing sector in the US with a compound annual growth rate of more than 9%.

Table 1.2 Growth Trend in Sectorwise World Electronics Production and India's share therein (Calendar Year).

(Value in US$ million)

SN	Sector	World Production					India's Production				
		1998	1999	2000	2001	CAGR (%)	1998	1999	2000	2001	CAGR (%)
1	Consumer Electronics	87670	90836	97776	104428	6.00	1674	1886	1973	2118	8.16
2	Industrial Electronics	137499	140660	150028	155057	4.09	479	556	572	596	7.56
3	Computer Hardware	311500	340067	378998	406222	9.25	557	580	603	645	5.01
4	Communication	252254	274349	306057	325164	8.83	1065	928	965	1008	-1.81
5	Electronics Components	288572	333574	395196	441757	15.25	927	1026	1091	1169	8.04
	Total Electronics Production	1077495	1179486	1328055	1432628	9.98	4702	4976	5204	5536	5.59

Source : -Yearbook of World electronics Data 2001/2002, Vol. 3&4, Reed Electronics Research, U.K.
-Data related to 1998,1999 and 2000 are current figures at current exchange rates.
-Data related to 2001 is forecasts at 2000 constant values & exchange rates (inflation not included).

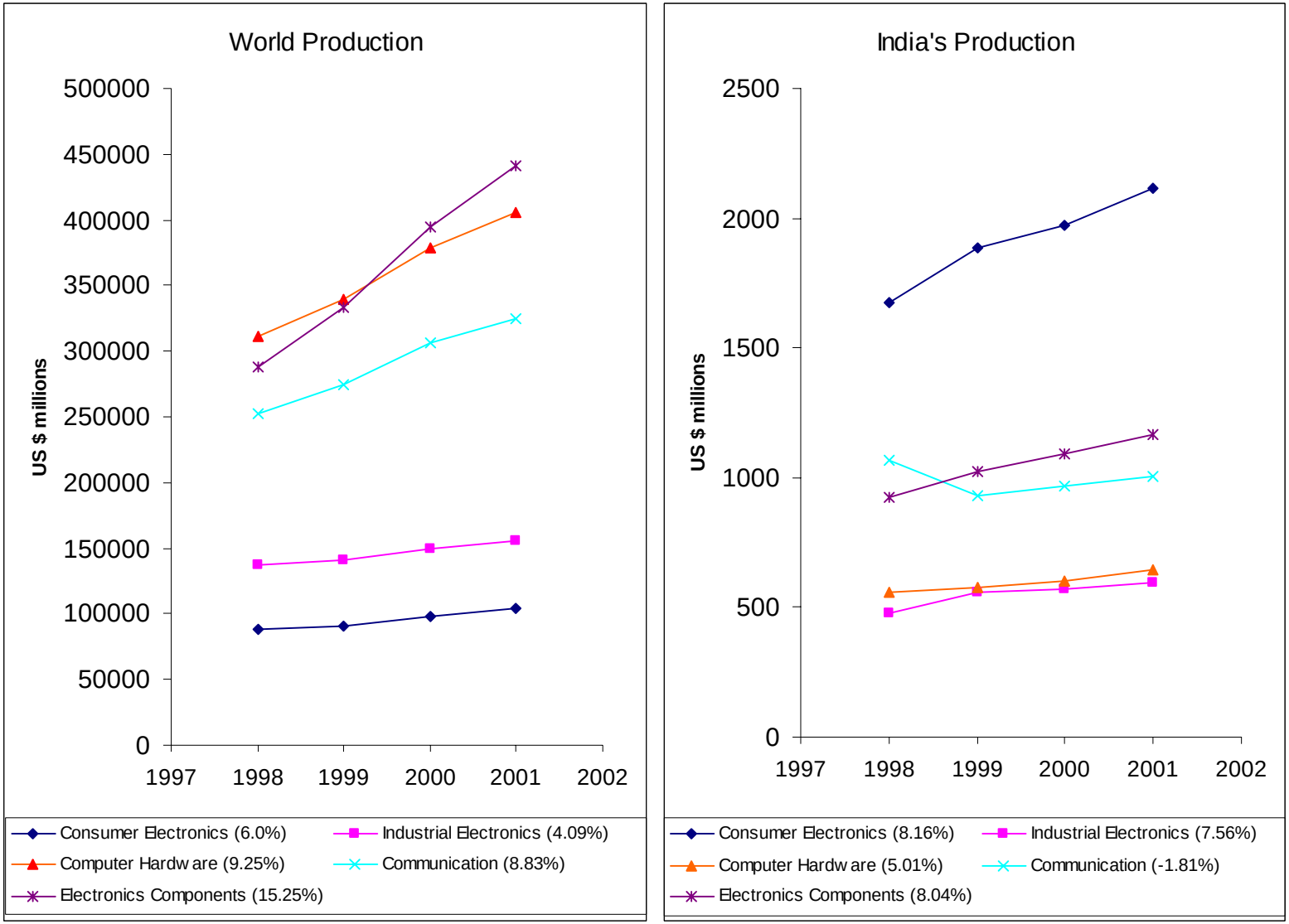
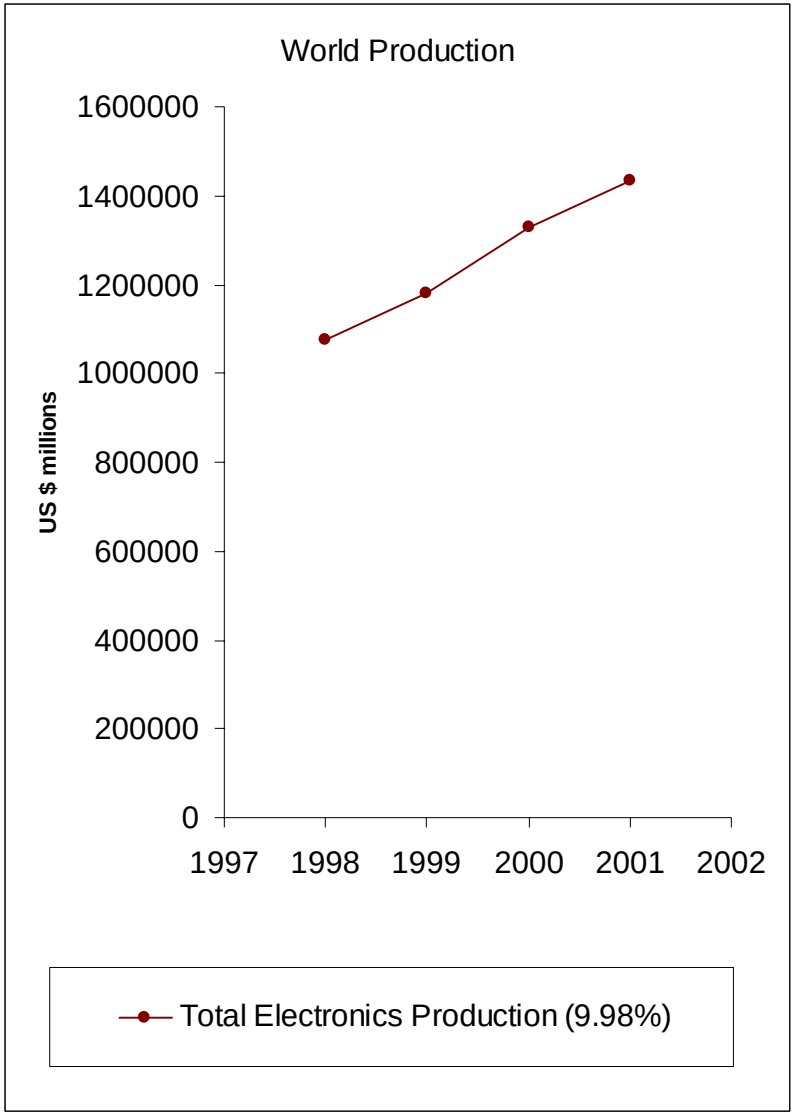


Figure 1.2 Growth Trend in Sectoral Electronics Production



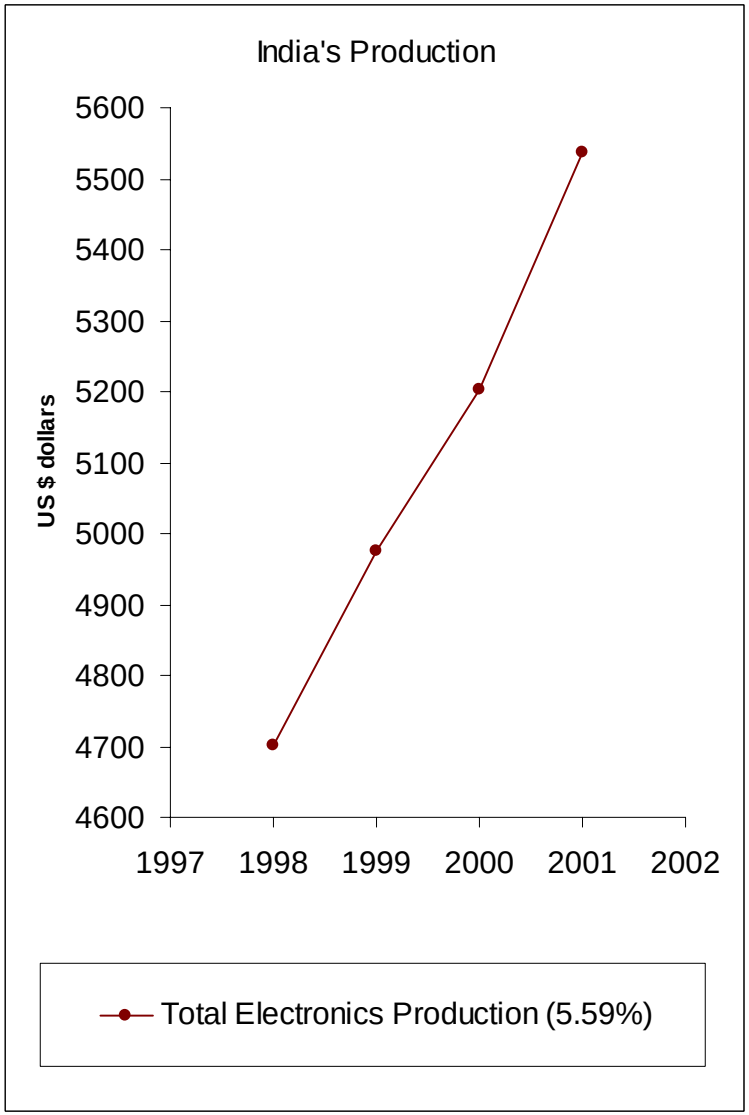


Figure 1.3 Growth Trend in Electronics Production

Growth in global Electronic component production has shown a sharp increase while Indian component industry has witnessed only a moderate increase. Consumer electronics production in India has shown fast increasing trend. Table 1.2 present growth trend in sector-wise world production in electronics and India's share therein.

Figure 1.2 shows that in global electronics, there is a clear high rise in component sector while rise in computer hardware and communication sector is moderate. During the same period, Indian consumer electronics segment is growing high while other sectors do not have any impressive rising trend.

Figure 1.3 indicates a sharp growth in India's overall electronics sector. These observations indicate that besides software there seems to be another segment i.e. consumer electronics which is fast coming up in India.

1.4 DEVELOPMENTAL PHASES AND STRATEGIES OF ELECTRONICS INDUSTRY IN INDIA

1.4.1 Pre-liberalisation Phase

The first major step towards the development of electronics in India was taken in August 1963, when the Government established the Electronics Committee in the Department of Atomic Energy under the chairmanship of Dr. Homi J. Bhabha to review the entire field of electronic components and equipment with regard to research, development and production, and advise the government on the best, quickest and most economical way of making the country self-sufficient in this field. The Committee recommended (Agarwal,1985):

> " Electronics is the nervous system of modern technology and has assumed an important role in the monitoring and control of the production process in the engineering, chemical and metallurgical industries. It is vital for atomic energy, communications and defence. Accordingly, it has become urgently

necessary to develop the electronics industry in the country to meet the multifarious needs of modern technology."

The Electronics Committee (known as the "Bhabha Committee") submitted its report in February 1966. It assessed the requirements of electronics over a ten year period and suggested ways and means of achieving adequate production to meet the requirements, with special emphasis on achieving self-sufficiency and self-reliance in the shortest possible time. The major recommendations of the Committee were as follows (Agarwal,1985):

a) Components are the crux of the electronics industry and should be manufactured in the country as quickly as possible.
b) In the field of general purpose components, manufacture in quantity is desirable in order to secure the economics of scale of manufacture, and also in order to ensure that research and development facilities will be available to the manufacturing units in order to keep it updated in regard to advances in technology which are extremely rapid in this very dynamic industry.
c) Equipment (as opposed to components) lends itself to manufacture on a smaller scale and the manufacture of equipment could, therefore, be organized in the manner.
d) For achieving the adequate production requirements of electronics products, equipment will have to be mostly imported or assembled from imported components.
e) Equipment required after about 5 years from now and later, should be qualitatively identified and developed in the country with a view to producing and issuing to users at the appropriate time.
f) In certain fields foreign collaboration should be sought for immediate development: but from the beginning Indian scientists and engineers should engage themselves in further developing and elaborating the technologies which we now acquire under license or otherwise from abroad.
g) In the field of components etc. from the beginning there should be standardization with a view to manufacturing in quantity certain preferred types of components.

h) About Rs.16,000 million worth of equipment would be required in the 10-year period from 1966 to 1975; ultimately the value of annual production would have to be of the order of Rs.3000 million: for establishing an industry of this size a total of approximately Rs.1700 million of investment would be needed over the 10-year period.

For better growth of electronics industry, all the recommendations made by the Bhabha Committee were appreciated resulting in appointment of a reconstituted Electronics Committee (after Dr. Bhabha's death in 1965) under the chairmanship of another eminent scientist Dr.V.A.Sarabhai for advising the government in the implementation of the recommendations in June 1966. The new Committee was made responsible to take account of the most urgent needs, keep track of the research being done in design and development and give guidance and direction, where necessary, identify sectors where indigenous production could be built up and promote the speedy building up of such capacity.

Recognizing the importance of developing an integrated and self-reliant electronics industry in the country and the need for rapid progress in this regard, the government established a separate Department of Electronics on 26th June 1970. The Department was placed directly under the charge of the Prime Minister of India due to its strategic importance. Subsequently, a special high-powered Electronics Commission was set up in February 1971 to lay down the policies and guidelines similar to those of Atomic Energy Commission and the Space Commission.

The Electronics Commission was charged with the full responsibility of reviewing the entire field of electronics with regard to research, development and industrial operations. It had full authority to formulate policy and to direct the implementation of all measures, both promotional and regulatory, that are necessary for the country to attain self-reliance to the shortest possible time and in the best possible manner.

During 1971, electronics commission set up an Information, Planning and Analysis Group (IPAG) with the mandate to provide information required by the electronics commission for decision-making and to disseminate information to laboratories, industries, entrepreneurs and all concerned with the growth of electronics industry. A regular monthly journal, “Electronics: Information and Planning” is being published since October 1973.

Since 1971, there has been a special thrust for setting up of electronics industries in different states. Electronics Development Corporations were set up in most of the States and Union Territories of the country. This was the revolutionary phase in the history of electronics industry. These corporations tried to ensure a balanced distribution of the electronics industry throughout the country.

In 1983, certain special tariff and tax concessions were announced for the electronics industry to give it a promotional push. Further, in March’1984, the Intellectual Property Right - 1956 was amended to allow the manufacture of some telecommunication equipment in the private sector such as private automatic branch exchanges (PABXs), telephone instruments, tele-printers, and data communication equipment for installation at subscriber’s premises.

1.4.2 Liberalisation Phase

During 1991, India embarked on the process of restructuring its economy. The new industrial, trade and fiscal policies introduced since 1991 have paved the way for greater technological advancement and international competitiveness of Indian electronics industry. The new industrial policies have made procedures transparent and quick, eliminated licensing in almost all sectors and provided encouragement to entrepreneurship through market friendly systems. The process of liberalization is expected to continue, until a free market economy is established.

The Eighth Five Year Plan (1992-97) in India aimed at creating an environment of not only high level of growth of electronics production but of

achieving the production levels at nearly international costs and prices. During the VIII Plan, as per DoE, the electronics industry witnessed a cumulative annual growth of 20 percent in production and over 40 percent in exports. The Indian electronics industry achieved a production level of Rs. 320700 million and an export performance of Rs. 95000 millions during the year 1997-98 (DoE,1996).

The principal strategy of the Ninth Five Year Plan is based on export, employment and productivity-led growth of Electronics and Information Technology.

A target of annual electronics production of Rs. 1383500 millions has been set for the terminal year of the IX Plan representing a growth rate of about 37% and will be about 2% of the world electronics production which at present is only 0.7%. An export target of about Rs.489300 millions has been set for the terminal year of IX Plan from about Rs.62870 millions during 1996-97 (the terminal year of the VIII Five Year Plan), with a growth rate of about 52% (DoE,1996).

These days, with de-licensing of the entire consumer electronics industry, liberalization in foreign investment and Export-Import policies, the country is witnessing new investments, restructuring of existing activities, diversification of the product range and an intensely competitive environment. All the renowned global brands have either established production facilities in the country or are present in the market through technical /financial collaborations, thus giving consumer a wider choice in terms of product features, technology quality and competitive prices. In order to achieve the above goals, the strategic imperatives followed in its Ninth Plan (DoE,1996) were :

- Production levels at international cost and prices
- Market promotion and export thrust
- Quality of products at internationally competitive levels

- Rationalization of procedures to ensure growth - identifying niche areas in the world market
- Strengthening R&D efforts
- Strengthening manpower base
- Computing in Indian languages

The penetration of computers in India at present, at two per thousand of the population is targeted to grow to ten per thousand by the year 2005.

Information Technology Era

The computer has its history in Indian industry as a productivity tool since about 1970. It was during 1984-85 that the decision makers, analysts and government machinery realised that Indian talent has potential in software industry which resulted in formulation of India's First computer software policy in 1986 and since than software has always been identified as a thrust area. Around 1986, during Shri Rajiv Gandhi's regime, India initiated building I.T. capabilities in its offices through National Informatics Centre (NIC) under the able leadership of its Director General, Dr. N. Seshagiri.

After about 10 years, the present Prime Minister of India, Shri Atal Behari Vajpayee in his address to the nation on 22nd March'1998 set a mission objective:

"to make India a global I.T. power and one of the largest generators and exporters of software in the world within 10 years"

This was followed by taking software on national agenda by the Government of India and creation of National Task Force on I.T. and Software Development in May'1998 under the order of the office of Prime Minister of India. The Task Force with Dr. Seshagiri as its convener comprised of Ministers, senior bureaucrats, scientists, academicians and industry

representatives. Task Force submitted its report on July 4,1998 with 108 recommendations (DoE,1998).

As a result of national level efforts, some of the states in India started providing thrust to this sector. Shri Chandra Babu Naidu, Chief Minister of Andhra Pradesh has led his state to the top of I.T. world. Hyderabad, which was known for “charminar” is today known for Information Technology worldover. After set up of National I.T. Task Force, more than 15 other states have already announced I.T. policies and some of them have come out with I.T. Task Forces and special committees.

Today, there is almost an I.T. revolution in India. India is getting more and more determined to strengthen the brand equity of its software industry and make the country as an I.T. superpower.

1.5 RATIONALE OF THE PRESENT WORK

To ensure a balanced distribution of the electronics Industry throughout the country, the states were encouraged to establish Electronics Development Corporation in the seventies. DOE also set up Public Sector units in electronics at various new locations in different states. Semiconductor Complex Ltd in Mohali in Punjab and Bharat Electronics Ltd in Panchkula in Haryana came with the same objective. Over the years, most of the state electronics corporations ventured into manufacturing operations to meet their primary role of promoting electronics Industry in their respective states. The onset of the liberalization process in the country and the consequent greater linkages with the global economy in most sectors of industry including electronics have posed several challenges for the state electronics development corporations, both for their operational as well as promotional roles. These challenges have materialized in the form of opportunities to be exploited and threats to be countered.

Punjab initiated its efforts for promotion of electronics industry way back in 1980-81, around the same time when Karnataka was exploring electronics

industrial investments in the state and Uttar Pradesh had already made its initial existence in this sector. Haryana also joined in this race sometimes around 1982-83. Inspite of the fact that the states of Punjab and Haryana also initiated their efforts around the same time when the states of Karnataka and Uttar Pradesh had made their entry, the states of Karnataka with its contribution of 19.71% in the national electronic production during the year 1994 and Uttar Pradesh with 18.28% were among the top two in the country in production of electronics and I.T. sector while the states of Punjab and Haryana were way behind with a negligible contribution of only 4.7% and 1.51% respectively during the same period.

The above facts reflect enough scope for conducting a comprehensive and systematic study to find out reasons for a very low growth of this industry in the states of Punjab and Haryana and to workout a strategic plan and make recommendations for better growth of electronics & I.T. Industry in these two states.

1.6 PROBLEM FORMULATION

The problem to be investigated in the present study entitled "**Electronics Industry in India and its Growth Potential in Punjab and Haryana**" was to study the past and present developments and explore further potentials in different segments of the Electronics and Information Technology industry.

It was observed that electronics industry has been divided into seven different segments by the Department of Electronics, Government of India and is the classification by the department is followed throughout the country. However, recently, Information Technology has emerged as a major segment. It has been found that Electronic and IT industry in India is mainly concentrated in specific regions in a state and the growth of this industry in that region reflects growth of the state as a whole. The study therefore is confined to locations in the four cities i.e. Bangalore representing growth in Karnataka;

Noida representing growth in Uttar Pradesh; Mohali representing growth in Punjab and Gurgaon representing growth in the state of Haryana.

The states of Karnataka and Uttar Pradesh were among the top two in the country in production of electronics during the year 1994 having contributed 19.71% and 18.28% in the national electronic production and hence considered as high growth states. The states of Punjab and Haryana had a negligible contribution of only 4.7% and 1.51% respectively during the same period.

All the four states i.e. Karnataka, Uttar Pradesh, Punjab and Haryana started development of electronics industry around the same period. In addition, the states of Punjab and Haryana are the most prosperous states of the country. As per 'Economic Survey – 1996-97' of Government of India, per capita net State Domestic Product in 1995-96 was Rs. 16,053 for Punjab, Rs. 13,573 for Haryana, Rs. 9,359 for Karnataka and Rs. 5,872 for Uttar Pradesh. Why the states of Punjab and Haryana remains the low growth states and other two raised to top position? There could be some factors causing hindrance in the development of electronics and IT Industry in these two states. Therefore, some strategy was required to be worked out to explore the growth potential in these deficient states (low contribution to national electronics production).

An attempt has been made to make a detailed and thorough survey of the various aspects of this industry in the high growth as well as low growth states in India to find specific advantages the high growth states are enjoying over low growth states and to workout a strategy how to benefit out of their experience to add in further potentials in this sector for the low growth states.

1.7 RESEARCH QUESTIONS

The study aims to provide answers to the following research questions:

1. What is the status of development of Electronics and IT Industry in India during pre and post liberalization phases?

2. Does the growth and development of Electronics and IT industry in the states of Karnataka and Uttar Pradesh is better than the growth and development of Electronics and IT industry in Punjab and Haryana?
3. How the state government policies and other factors such as Institutional support, Infrastructural facilities, Technology, Human Resource Development, Finance and Marketing influence the growth of Electronics and IT industry in the states?
4. Which are the growth areas to be focused by the states of Punjab and Haryana for the development of Electronics and IT industry in the respective states?
5. What strategy should be adopted by the states of Punjab and Haryana for a better growth of Electronics and IT industry?

1.8 OBJECTIVES OF THE PRESENT STUDY

1. To know the present level of growth and development of Electronics Industry in India in the context of developments in the industry world-over.
2. To study the past and present government policies for development of Electronics and IT industry in India.
3. To compare state government policies and initiatives, and other factors such as Institutional support, Infrastructural facilities, Technology, Human Resource Development, Finance and Marketing for the growth of Electronics and IT industry in these states.
4. To compare the growth and development of Electronics and IT industry in the states of Karnataka, Uttar Pradesh, Punjab and Haryana.
5. To identify growth areas and suggest suitable strategies for development of Electronics and IT industry in the states of Punjab and Haryana.

HYPOTHESES

The hypotheses are stated in Section 2.6 at the end of the chapter on Review of Literature

1.9 THESIS STRUCTURE

The study has been presented in seven chapters and is given in Table 1.3.

Table 1.3 Thesis Structure

Chapter Number	Title
Chapter - 1	Introduction
Chapter - 2	Review of Literature
Chapter - 3	Method and Procedure
Chapter - 4	Performance Analysis of Indian Electronics and I.T. Industry
Chapter - 5	Evaluation of Electronics and IT Policies and Institutional Support at National and State Level
Chapter - 6	Analysis of State Level Growth in Electronics and I.T. Industry.
Chapter - 7	Conclusions and Recommendations

The first chapter titled "**Introduction** " describes historical developments in the electronics industry both at International and National level, its characteristics, classification, its production trends and developmental phases. It also explains clearly the rationale of the present work, problem formulation, the objective of the study and scope of investigation followed by methodology adopted. Finally, it presents the research work carried out in the study through chapterisation for reflecting the overview of the complete research work.

The second Chapter is titled as "**Review of Literature** " and highlights in brief the work already done in this field in India and abroad and further, justifying need for the present work.

The third chapter titled “Method and Procedure” describes the methodology in terms of the research design, sampling design, questionnaire design, methods of collection and the analysis of data. Further, pre-testing of the questionnaire, its validity and reliability and the techniques used for analysis of the final data are outlined. The methodology of the pilot and the main study is explained in this chapter.

The fourth chapter titled “**Performance Analysis of Indian Electronics and I.T. Industry**” is devoted to in-depth study and analysis of growth in electronics and IT industry in India. Performance of the sector during various five year plans and achievements against targets fixed for the plans have been analyzed. Further, growth in each of the seven segments of electronics and IT industry has been critically examined to arrive at specific findings. Based on these findings, certain observations have been concluded in form of recommendations for better growth of this sector of industry in India.

The fifth chapter titled “**Evaluation of Electronics and IT Policies and Institutional Support at National and State Level**” describes in detail the initiatives at national as well as state level in the electronics and IT sector. The electronics and IT policies along with prevailing incentive package offered by the states under study have been critically examined and explained at length. Initiatives at state level by government as well as Industry efforts in regards to establishment of specific infrastructural facilities for the electronics and IT sector based on the parameters namely sector specific R&D and technological up-gradation, adequacy of bandwidth for software exporters, adequacy of sector specific industrial complexes and working office space, availability of specific technical skill base, financial and marketing support and availability of quality electric power and general industry specific requirements have been critically examined and presented in this chapter. Further, the investigation of the primary data acquisitioned from electronics and software industries of the four states under study through questionnaires and schedules and the expert views of experts of the field have been supplemented to arrive at specific findings. Based on the findings, certain observations have been concluded in

the form of recommendations for better growth of this sector of industry in the states of Punjab and Haryana.

The sixth chapter titled "**Analysis of State Level Growth in Electronics and I.T. Industry** " describes in-depth study the growth of the Electronics and Software industries in the states of Karnataka, Uttar Pradesh, Punjab and Haryana. Post-liberalization trend in electronic production in these states and their contribution in the national production have been compared and thoroughly analyzed. Further, sectoral growth of this industry in each of the four states have been examined and presented. Then, the productivity and employment generation by this sector in the above states during the same period have been analyzed. Electronics product range being produced in these states has been critically examined to foresee potential and future for a specific sector in a particular state. Conclusions from primary data and views of the experts of the field have been critically analyzed and supplemented to arrive at specific findings. Based on these findings, certain specific observations have been concluded in the form of recommendations for better growth of this sector of industry in the states of Punjab and Haryana.

The seventh chapter titled "**Conclusions and Recommendations**" attempted to present conclusions and recommendations for accelerating the growth potential of the electronics and I.T. industry in the states of Punjab and Haryana.

CHAPTER - 2

REVIEW OF LITERATURE

An attempt has been made to review the literature pertaining to various aspects of electronics and software industry. The review of studies provides proper prospective about the research problem and helped to formulate a suitable methodology of the study.

The review of the literature carried out has been presented under the following four heads:

a) Performance of the Electronics and Software Industry at National and International level,
b) Government Policies and Infrastructure Initiatives in the Field of Electronics and Software Industry,
c) State Government Initiatives and Growth of Electronics and Software Industry in the Four States Under Study,
d) New Emerging areas and Future of Electronics and Software Industry

2.1 Performance of Electronics and Software Industry at National and International Level.

In manufacturing of electronic components, economies of scale had a vital bearing on cost; indigenous primary materials were available at a cost much higher than the cost of imports; lack of tool room facilities and a tedious licensing procedure for imports involving delays ranging from 18 to 24 months were the major factors affecting development of electronics industry as identified by **Seshagiri** (1975) in his critical study of electronics Industry in India to prepare a report on “Perspective Report on Electronics in India”. It was further concluded that difficulties in bringing down the prices contributed to the slump in the industry. The study found that in the mid sixties the growth rate was higher than the one originally assessed in the Bhabha committee report which slows down around 1969.

The growth in production, imports and exports in electronics Industry through his study on “Electronics Industry in India: Past Strategies and Future Possibilities” was examined by **Agrawal** (1985). It observed a low performance of the industry. Growth rate of electronics production during 1973-83 was observed as 19% and was projected to raise 42% during the period 1983-89. The study concluded that lack of in-house R&D was the major reason for failure of Indian products in international market. He further concluded that the factors that have contributed to the slow and unsatisfactory growth relates essentially to the government policies and strategies.

In a survey conducted by **DoE** (1985) on “Study Report: Market Potential of Indian Electronics Industry during the Seventh Plan (1985-86 to 1989-90)” it was concluded that in India the level of uses of electronic products in both household as well as business sectors is very low. It was seen that there was high prices and low consumption state and hence no volume production as in other countries. This resulted in high costs leading to high prices which restrict demand. It was further observed that high costs were the result of high duties and high interest rates. The study suggested that all indirect taxes were required to be kept as low as possible, if not made zero. It was further observed that customs duties were required to be so regulated that it helps the development process of internationally competitive electronics industry. It suggested that in the coming years more consumption through cost reductions duly supported by the right technology and appropriate rates of taxes and duties needed to be encouraged.

Electronics production in 1984-85 was observed to be 0.8% of GDP and **DoE** (1987) predicted it to rise to 3% by the year 1989-90. Its report on “Growth of Electronics in India” described sector-wise status of electronics industry, infrastructure facilities available and future growth prospects of the industry in India in its. It was observed that the concept of setting up an industrial estate exclusively for electronics was the most successful development in India as it not only helped in achieving higher growth rate but had also created a reservoir of trained skilled manpower and technologies.

The work on " Marketing Strategy of Selected Units in the Organised Sector of Consumer Electronics Industry in India " by **Sood** (1990) concluded that during 1981-88, Video accounts for 69.3% and Audio 23.1% of the total consumer electronics production in India and electronics small scale industry had contributed about 50-70% of total Indian production. It further concluded that UP Electronics Development Corporation, representing public sector had followed a cost plus approach in pricing with prices below the industry average and CROWN, representing private sector followed competition oriented approach with prices above industry average.

The important factor in change process is people, propensity and motivation to participation was the finding by **Malhotra** (1991) as a result of attempting to examine adaptive capabilities of electronics industry in India through her study on "Organisational Change: A Study of Selected Electronics Organisations in Northern India" and concluded that. The study suggested that to expedite transition to the control via budget and standards, there was a need for result based leadership conforming to requisite organisational state and characteristics. It further suggested that for an organisation to remain dynamic, it should define its environment segments properly and scan it thoroughly.

It was forecasted that the component industry which was exporting 15% of its production in 1992 would be five times by 1994-95. **Govil's** (1992) study on "Export Marketing of Electronics Products in India (with special reference to electronic components industry) – A Critical Appraisal" concluded that as electronics component industry had a large variety of technologies with complexity varying from low level to a highly advanced level involving different degrees of investments and risk elements, this industry needed to follow one country international standards which may be of USA. It further suggested that to achieve international prices, inputs to the component industry would need to be provided at the international prices. it further suggested liberalizing induction of foreign technology. The study also highlighted that there was a need that policies be made favourable for modernisation / expansion of existing component units.

Tiwari (1993) analysed the various determinants of fixed and inventory investments in electronics industry in India over a period of 10 years (1979-89) in his study on “Determinants of Investments in Electronics Industry in India“. A survey of public sector electronic units like: ITI, BEL, ECIL, CMC and CEL and private sector units like: Nelco, ICIM and Usha Rectifier was conducted. It concluded that Tax holiday was the major incentive that led development of units under Santacruz Electronics Export processing Zone (SEEPZ), Mumbai. It further concluded its finding that strategy for growth of Industrial electronics industry had aimed at export substitution, self reliance and public sector led growth.

A survey was conducted by **Arun Kumar** (1995) to examine the scope of future electronic products and based on opinion poll, found that there was further scope of manufacture of LSI/VLSI, communication & switching equipment, medical electronics equipment, computers and computer peripherals. His study on ”Present Status and Future Projections of Electronics Industry in Mohali (S.A.S. Nagar) District Ropar, Punjab “ conducted a survey of Mohali based electronics units like PRL, SCL, Punwire and ESPL set up during 1971-80 and PPPL, PCL, Mitgart, Incomnet and JCT established during 1981-90. Data pertaining to these units was collected from the P.S.E.D.P.C.L. The study concluded with the status of the industry at that point of time.

An analysis of the trends of manufacturing of electronic equipment and components in India under restructuring policy phase (before 1980), Partial liberalised policy phase (1981-90) and liberalised policy phase (1991-94) was conducted through a survey of 80 electronics and telecom enterprises by **Dogra** (1995). In his study on “Managing Foreign Collaborations in Electronics and Telecom Sector – A Study of Process and Impact in Entrepreneurial Enterprises“, the information was collected with two structured questions one pertaining to Technology transfer and other to see the impact of transferred technology on organisational structural variables. Focus of the study was on the organisational set up. It was concluded that transfer of appropriate technology led to success of the organisation.

Monopoly status of VSNL needed to be discontinued in India was the conclusion drawn by **Bajpai, Nirupam and Shastri** (1998) in their paper on "Software Industry in India: A case study". They further concluded that the cost of telephone connection was also required to be reduced. The study observed that M/s. Infosys Technologies which started its operations in 1981 with just Rs.10,000/- is worth Rs. 10,000 millions today. According to the study, the current global market share of Indians is only 0.5% today. The study included issues related to Operational, Manpower, Finance, HRD and Marketing aspects of the industry.

The studies relating to performance of Electronics and Software Industry at national and International levels drew conclusions / made suggestions with respect to the following aspects:

Major weaknesses

- Tedious licensing procedures for manufacturing and imports of products.
- No economies of scale in manufacturing of components.
- Lack of in-house R&D was the major reason for failure of Indian products in international markets.
- Unfavourable government policies and strategies.
- Lack of volume production is causing high costs, leading to high prices, which restricts demand.
- High costs were due to high duties and high cost of finance.

Suggestions

- Need for result based leadership in the organisations.
- Need for libralised policy for induction of foreign technology.
- Need to provide inputs to component industry at international prices.
- Tax holiday was the major incentive for development of electronics industry in SEEPZ.
- Transfer of appropriate technology led to success of the organisation.

- For better growth of telecom sector, monopoly of VSNL needed to be discontinued.
- Cost of telephone connection need to be reduced.
- There is further scope for manufacturing of LSI/VLSI, Communication and Switching Equipments, medical electronic equipments, computers and computer hardware in Mohali.
- The success of concept of exclusive industrial estates for electronics became of its positive impact on growth, manpower development and technology

The major policy initiative of liberalization and globalization of economy in India started in 1991. As a result, the Industry was exempted from the compulsory Industrial licensing. As of now on only four industries are reserved for the Public Sector and six industries fall under the compulsory licensing. Today, there is no restriction on induction of foreign technology. Privatisation of telecom sector in India during year 2000 has automatically discontinued monopoly of VSNL which has resulted in drastically reducing cost of telephone connection in India. The literature has also revealed that most of the industries recognizes the need for quality improvements for a better growth in the sector.

Most of these studies covered pre-liberalisation period i.e. before 1991. There appears enough scope for carrying out the study and making an analysis of performance of electronics and software industry in India, particularly in post-liberalised phase (1991 onwards).

2.2 Government Policies and Infrastructural Initiatives in the field of Electronics and Software.

The study of **Agarwal** (1985) attempted to examine the government policies and efforts in promoting electronics industry in his research paper on “Electronics Industry in India: Past Strategies and Future Possibilities” and concluded that Government needed to give freedom to the entrepreneurs to set up industries without any restrictions on capacity and use of indigenous

technology alone. It suggested that there be no government restriction on MRTP and FERA companies to undertake the manufacture of electronics items.

The paper on ”Impact of Liberalisation Policy on Indian Electronics Industry” presented at INTRONICS-94 seminar examined the sector-wise impact of liberalisation policy on Indian electronics industry both private as well as public sector and indicated that 1989-92 was the difficult period for this industry due to set back in consumer electronics sector which was overcome in 1992. **Nambiar** (1985) pointed out that the impact of foreign technologies which were imported by the industries in this sector was clearly seen on growth in telecom sector in India. The study concluded that computer hardware showed insignificant growth. Component industry after significant growth during 1983-89 was observed to be stagnated whereas Industrial electronics showed a low growth rate. The author pointed out that economic liberalisation did not contribute to any significant growth of the Indian electronics industry till 1994. It further highlighted that lack of growth in this sector was due to failure of electronics component industry. The author suggested a zero duty structure and lower interest rate of 4-6% on working capital. It was seen that in the professional grade telecom system, the imported component constituted almost 80% in terms of material cost. The author stressed upon encouraging indigenous manufacture of micro-electronic devices. He pointed out that PSUs could not get benefit of liberalisation due to government control and the traditional management structure with the real powers of decision making vested away from the place of operation.

The restructuring of R&D agencies of DoE with a clear definition of responsibilities and accountabilities and involving private sector in R&D and necessary linkage with academic institutions was concluded to be the need of the Industry in a study by **DoE** (1987). The study on “New Initiatives for R&D in Electronics“ further proposed setting up of Venture Capital Fund.

Alum, Ghayhr and Dieter Ernst (1990) examined various aspects of India’s liberalised electronics policy in their study titled “The Indian Electronics

Industry: Current Status, Perspectives and Policy Options“. Four case studies on PCs, Colour TVs, Electronics Switching equipment and ICs were conducted. The study had constraints of being written in Aug-Sept 1990 that means less than a year effect of liberalisation policy was seen. The study concluded that except for ICs indigenisation had occurred for most components but at high cost; local design of colour TVs were non-existent and High production costs rendered Indian CTVs uncompetitive in export markets. Production of ICs was also highly inefficient and non-competitive. It further concluded that there was a sharp increase in the number of manufacturers causing increase in competition that has resulted in lower prices. The study pointed out that innovation became unattractive. The author highlighted that liberalisation policy did not significantly alter the market structure of IC manufacturing companies that were mainly from government. The study further concluded that low volumes, high costs of components and inefficient production techniques were responsible for poor export performance in the Indian Electronics Industry.

The study of **EFY** (1996) on “R & D in Electronics Industry” stressed on technology integration: each company need to select its niche for its dedicated contribution (like Intel, world leader in microprocessors and Microsoft in Software had done). The study suggested a need to establish an Institution to keep the inventory of updated status of discoveries & inventions and also keep track of on-going research with universities, MNCs, research centres etc. It further stressed on a strong Industry -Institute interface, regular interaction between Industry executives and academicians, adoption of one lab in an engineering college by every big industry. The study emphasized on improving Quality of faculty, periodic upgrading of curriculum and student-Industry interface. It observed that Ninth national plan, which was in the stage of finalization, had stressed on R&D activities in the new emerging areas such as microelectronics and telematics. It was further observed that a sum of Rs. 601.5 m ($ 15 m) was allocated for 20 R&D projects in DoE while in USA, a single company ‘Intel’ allocated $ 500 m for a single project to produce its Ramous chip. The report highlighted that Indian scientists are capable of doing high quality R&D but most of them do so in foreign countries because of lack of proper infrastructure facilities in India.

Inclusion of research centres to qualify for registration of software exporters under STP scheme as it was noticed that I.T. exports were not fulfilling their potential was considered important. The study on “The Indian Software Industry – Part-I“ by **Ahuja** (2000) found that factor for stifling the innovation of new products in India was the low level of interaction between Universities, research centres and industry. It further concluded that to reduce red-tape and to gain competitive edge of new technology/ideas, investments by large units in startups and even "Spin-off" would bring good results. Study described National Task Force’s key feature was for improving the country’s communication infrastructure and fueling corporate I.T. development. It further stressed on bringing down the cost of International telephone calls in India. The author pointed out that government’s 108 point I.T. program (recommendations of national IT Task Force) benefits large companies only and neglect most of the startups as startups needed greater university & research support and finance which were not covered by the program.

Literature related to government initiatives with regard to policies and infrastructure requirements of the electronics and software industry have been studied as presented in the above sections. The studies drew conclusions / made suggestions with respect to the following aspects:

Major weaknesses

- Restrictions on capacity and use of indegeneous technology alone.
- Lack of growth in Electronics Industry was due to failure of component industry.
- Low volumes, high costs of components and inefficient production techniques resulted in a poor export performance.
- Low innovation of new products was due to low level of interaction between Industry-University-R&D Centres.
- It was observed that a sum of Rs. 601.5 m ($ 15 m) was allocated for 20 R&D projects in DoE while in USA, a single company ‘Intel’ allocated $ 500 m for a single project to produce its ramous chip.

Suggestions

- There should be zero duty structure.
- Interest rate on working capital should be as low as 4-6%.
- Need to encourage indigenous manufacture of micro-electronic devices.
- Need to encourage involvement of industry and academic institutions in R&D.
- Libralisation policy caused a sharp increase in number of manufacturing companies and hence more competition which resulted in lower prices.
- Each major electronic company need to select its niche for its dedicated contribution in R&D in that field (like Intel, world leader in microprocessors and Microsoft in Software had done).
- Need for a strong Industry-Institute interface.
- Need for adoption of a lab in an Engineering college by every big Electronics Industry.
- Need for an Institution to keep updated database of discoveries and inventions and on-going research with Universities, MNCs, Research Centres etc.
- Need to bring down cost of international telephone calls in India.

As a result of liberalization in India since 1991 and privatization of telecom sector, restrictions on capacity and use of indegeneous technology alone has automatically been removed by the government and tariff of International calls have come down significantly. Interest rate on working capital to the Industry has also come down from 14-18% to 6-8% per annum.

It further appears that government policies have a major role to play for high growth of this sector of Indian industry. Therefore, there is a need to examine the present policies and infrastructure initiatives by government at the national and state levels and find out their shortcomings and lacunae to bring about a renewed growth in the electronics and software industry.

2.3 State Government Initiatives and Growth of Electronics and Software Industry in the Four States under Study.

IE&MR (1994-95) examined the relative attractiveness of states and concluded that incentives and taxes were considered to be relatively less important as compared to the infrastructure while deciding a new location by the industry. The study which was sponsored by PHDCCI further concluded that Punjab scores high on the important infrastructure parameters like power and water while ranks very low on stability of political setup which had adversely affected foreign investments. As per the survey, Maharashtra stands highest in overall ranking of investment climate followed by Gujarat, Delhi, Punjab, Haryana, H.P., Rajasthan and U.P.

Assessing the internal strengths and weaknesses and redefining objectives of PSEDPCL was done by **Tata Consultancy Services** (1998) in their study on 'Punjab State Electronics Development and Production Corporation – Perspective Plan" Volume-I (Analysis and Recommendations) and Volume-II (An analysis of the electronics industry). Further the study identified business areas and described status of electronics industry. The study found that the political scene in Punjab over the last decade had led to a decline in the growth rate of industry in the state. TCS observed that corporation's companies like: CEPL, PBML, PEOSL, Intermagnetic Ltd. and Zimag Ltd. have closed their operation. It recommended these companies to be voluntarily wounded up. In regards to other companies of the corporation the report recommended PPPL to be revived as it was commercially viable, PRL's performance to be enhanced and Corporation to divest its stake in PCL to a minority holding. TCS suggested following as areas of operation for the corporation: Infrastructure development for specific sectors, joint venture with private sector, equity participation in assisted sector, advisory services, Training and R&D Linkages.

A survey of electronics industry in Mohali concluded that position of ancillary units suffered with financial problems, while banks pressurize to pay up in time, their own money was held for six months or ever more. The article

on ”A Dream Gone Sour: Mohali Industrial Area“ described that the Punjab government acquired 1189 acres of land during 1970-71 in Mohali to develop the Silicon Valley of Punjab. **Nonika** (1999) concluded that the industrial plots were invariably allocated to the near and dear ones of the powers, which resulted in 40% of plots still lying vacant and 20% not being used for the purpose it was allotted. The survey further concluded that most units failed either to upgrade technology or to indigenise the production process and in turn lost the competitive edge resulted in their failure to capture market. The study highlighted that in India companies are expected to meet the order requirements in 3 months time compared to China where the order is placed for three years. The survey highlighted that on many occasions for small players, the cost of plot was even higher than that of the entire project. The author had blamed the state government for their failure to attract fresh investments and to sell Mohali as the destination.

The Study titled “A Study of Organisational Climate in Relation to the Job Satisfaction and Managerial Effectiveness in Electronics Industry in Punjab“ concluded that fear and punishment theory was no more successful in the organizations as it leads to frustration and dissatisfaction and hence, did not motivate the executives. It further concluded that proper training to executives was required for high level of effectiveness. **Ritu** (1999) further stressed that the levels of the three variables i.e. organizational climate, job satisfaction and managerial effectiveness among the executives working in organizations should be checked on continuous basis.

Chautala (2000) on the occasion of the Independence day, said that the new state policy on Industries (November’1999) aimed at increasing the share of industry in the state GDP from 24% to 30%. It was pointed out that as a government initiative under the policy, in view to attain sustainable economic development, the state had set up an economic development board and a land bank of 4000 acres was being set up in the national capital region. The chief minister of Haryana state said that the new state IT policy was targeting at effective e-governance. A state ‘IT Initiative Fund’ with an initial corpus of Rs. 100 million was set up for e-governance and to promote IT in the state besides

another fund of Rs. 50 million for setting up an IIIT at Gurgaon. Chautala further said that new education policy laid stress on computer education and introduction of English from class I level. He further pointed out that the state had already abolished octroi and had decided to implement uniform rate of sales tax.

The reason for closer of the subsidiaries and joint venture units of the PSEDPCL except PUNCOM and PRL in Mohali was concluded to be the mismanagement and corruption at the highest level. In his article on ”Decline of Punjab’s First Silicon Valley”, **Sukhmani** (2000) mentioned that even PUNCOM was heading towards a collapse. The author charged heads of these units of running their parallel ventures in the same line of business. It was further pointed out that there was no professionalism, vision or strategy to make the units grow. It further indicated that new IT units were recruiting their relatives having no background of IT to run these units considering that they can better manipulate Punjab bureaucracy.

A pioneering work by **CRRID** (2002) revealed that instead of a state wise, isolated approach to industrial development, a collaborative, interdependent approach for the region as a whole should be put into place. In one of the concluding remarks of the study, forecasted that the development process including industrial development would increasingly depend not on capital resources but on knowledge resources. This would require that the existing industrial policies and the various incentives that are offered on a competitive basis by different states to attract investment will need to be critically reviewed. The report on “Punjab State Development Report-2002” further suggested that more EHTPs in the state on private initiative and with government support be established and to set up R&D centers in participation with industry.

The various studies on “State Government Initiatives and Growth of Electronics and Software Industry in the four States under Study” drew conclusions / made suggestions with respect to the following aspects:

Major weaknesses

- Foreign investment in Punjab was adversely affected due to low stability of political setup.
- Political scene in Punjab led to a decline in growth rate of Electronics Industry.
- Faulty identification of entrepreneurs for allotment of industrial plots in Electronics Estate in Mohali caused establishment of only 40% electronic set ups.
- Ancilarisation in Mohali failed as they were unable to upgrade technology and also the financial crisis arises due to non-payment of dues in time by the large companies.
- Subsidiary companies of PSEDPCL in Mohali were closed down due to mismanagement.

Suggestions

- Infrastructure is relatively more important in comparison with incentives and taxes in selecting a new location by the Industry.
- Subsidiary companies of PSEDPCL in Punjab having no operations should be closed down.
- Training to executives required on regular basis.
- New education policy in Haryana stressed on computer education and introduction of English from class-I level.
- Future industrial development would increasingly depend on knowledge resources than the capital resources.
- More EHTPs need to be set up in Punjab on private initiative and with government support.
- Need to set up R&D centers in participation with industry.

As proposed by TCS in its report of 1998, the subsidiary companies of PSEDPCL in Punjab having no operations have already been closed.

No researcher has tried to find the reasons for a low contribution by the states of Punjab and Haryana in the national electronics production inspite of

the fact that one, the northern states have contributed 37% to the national electronics production two, these two states are otherwise most prosperous states in this part of the country.

2.4 New Emerging areas and Future of Electronics and Software Industry.

An observation that the high employment generation per unit of capital is one of the characteristic of the electronics Industry was recorded by **DOE** (1992). Study on “Role of Electronics in Tackling National Priorities” found that number of jobs per Rs.10 million investment in 1989-90 was highest in electronics sector recording it to be 146 (employment ratio). It further observed that computers were being used to provide effective teaching aid for both formal and non-formal education. It further mentioned that electronics based sophisticated instruments are used for diagnostic therapeutic patients, monitoring and analysis of data to provide an improved health care system. Electronics has enhanced productivity in agriculture. The study further concluded that application of electronics has strengthened infrastructure in terms of energy, transport, communication etc. Study further highlighted that this sector accounts for 4% of industrial output and 1.3% of the GDP.

In his most celebrated article on ”Is Vision $100 Billion Achievable?” **Srivastava** (1999) stressed that India would be facing stiff competition from countries like Philippines and China because our salary costs had gone up and the quality of infrastructure was poor in comparison with the other countries. The author further highlighted some of the important issues to be considered to achieve our ambitious vision of $100 billion worth software export by the year 2010.. The article suggested that India needed to invest in parallel back up power generation. It further suggested that changing our mindset to stop considering ourselves as Indian exporting companies but more as international companies doing bulk of their software development in India. It stressed upon taking up seriously business in back office functions such as medical transcriptions, call centres, legal databases and Insurance claim processing.

Vittal (1999) emphasized that India should target to become an "economic superpower with the use of IT rather than becoming only the IT superpower. In his paper on "India's New Lever of Growth", Vittal indicated that Indian software export had gone up from $100 million in 1990 to $2.6 billion in 1998. It further mentioned that a target of US$60 billion by the year 2008 was set up by the National Task Force while a joint study by McKinsey and NASSCOM forecasted it to be even higher to $100 by the year 2010. It also highlighted that the Indian software export was slowly moving from merely body shopping to software products and was estimated to be 24% in that year. Author concluded that developments in the areas of graphic intelligence based script technology; E-commerce and E-governance were needed to be targeted by Indian companies for further business. It suggested that states like Kerala and A.P. could explore implementation of their own cyber laws.

The issues like red-tape and the higher cost of finance are the major causes for low growth of manufacturing industry and also failure of EHTP scheme in India was revealed by **Vittal** (1999) in his paper on "India as an I.T. Superpower: Leveraging the Designing Capabilities". Author further described needs/capabilities for India becoming an IT superpower instead of only a software superpower. Finding of World economic forum stating that India ranked 45th out of 52 in countrywide competition was highlighted. The paper concluded that to become IT superpower India needed to increase its share of less than 1% to about 5% of world's software development by the year 2003. The author stressed upon promoting foreign investment in setting up software design centres alongwith manufacturing (fabrication centres) in India. The paper suggested declaring the whole India as a duty free area so far as electronics hardware is concerned.

Dewang Mehta (2000) found cost effectiveness, world-class quality, high reliability, rapid delivery, traditional mathematical ability and state-of-the-art technologies as the Indian competitive advantages for software industry. In his article on "India.com Goes Global", the author pointed out that with an annual growth rate exceeding 50%, Indian software sector had expanded almost twice as fast as the US software did during 1990-99. Article highlighted

findings of a World Bank study according to which India's share in global customised software had raised from 11.9% in 1991 to 19.4% in 1999 while share in products and packages market was less than even decimal of 1%. In respect of achievements, the author indicated that in 1998-99, more than 203 of Fortune-1000 companies outsource their software requirements to India and market capitalization of Indian Infotech companies was recorded to be US $ 27 billion as on December 9,1999. He further pointed out that 158 Indian software companies had acquired International Quality Certification and as an Indian pride, 11 out of 17 companies in the world who have acquired SEI levels maturity were located in India. The author stressed on Indian software companies for creating of original technology, development of products and packages. He emphasized to accelerate the rate of PC penetration in India from 3.6 per 1000 in 1999 to one per 50 with universal access to Internet by the year 2008 and converting of about 0.6 million existing PCOs to Public Tele-Info Centres. He further stressed on increasing internet connections from 0.5 million as on Dec.1'1999 to 50 millions in next ten years by using cable TV as medium. Article further pointed out findings of a survey by NASSCOM that by 2010, IT would contribute towards 28% of India's GDP and forecasted that normal Indian Government would be converted into Smart Government.

The article on "Integrating IT into Mainstream Industry" explained that according to Moore's Law, the chip's processing power was doubling every 18 months and for the last 30 years, computers were living upto Moore's Law. It indicated that Indian Software exports had reached from just US$ 2.5 million in 1974 (India's first software export order was from Burroughs, USA to TCS) to US $ 4 billion in 1999-2000 which is only 1.5% share of global market. The author suggested that India need to increase its share in software branded product which was only 8% of India's software export revenue (on-site being 58% while off-shore accounts to 34%). It further concluded that as per Moore's Law, hardware developments would be over in 10 years while software developments might take around 20-30 years time and after that IT will become merely a tool, an aid in other Industries. **Kochchar** (2001) therefore suggested that India needed to take steps to integrate IT into the mainstream Industry.

The studies on “New Emerging Areas and Future of Electronics and Software Industry” forecasted potential of Indian industry in software development with specific developments in graphic intelligence based script technology, E-commerce, E-governance, customized software, medical transcription, call centers, legal databases and insurance claims processing. The stress should be on original technology, developments of products and packages. McKinsey and Nasscom forecasted a software export of US$100 million by the year 2010. The studies drew conclusions / made suggestions with respect to the following aspects:

Major weaknesses

- Issues like red-tape and the higher cost of finance are the major causes for low growth of manufacturing industry and also failure of EHTP scheme in India.

Suggestions

- Number of jobs created per Rs. 10 million investment in 1989-90 was highest in electronics industry (employment ratio as 146).
- India would be facing stiff competition from countries like Philippines and China because our salary costs had gone up and the quality of infrastructure was poor in comparison with the other countries.
- Industry need to stress on exploring new business areas of back office functions such as medical transcriptions, call centres, legal databases and Insurance claim processing.
- India should target developments in the areas of graphic intelligence based script technology, E-commerce and E-governance.
- Indian software export is slowly moving from merely body shopping to software products.
- Whole of India should be declared as a duty free area for electronics hardware.
- Indian software companies should work towards creating original technology and development of products and packages.

- India needs to accelerate the rate of PC penetration in India from 3.6 per 1000 in 1999 to one per 50 with universal access to Internet by the year 2008.
- India needs to take steps to integrate IT into the mainstream Industry.

2.5 CONCLUSIONS

After going through the work of various researches, it has been found that most of the researchers have used secondary data alone as a base of their study. Major source of this data has been the Department of Electronics (Now renamed as the Department of Information Technology), Government of India. As the data has been acquired from different published sources it may suffer from all deficiencies related with secondary data. A very low contribution of the states of Haryana and Punjab in the total national electronics production has also failed to attract attention of any researcher.

No researcher has ever tried to find the reasons for a low contribution by the states of Punjab and Haryana in the national electronics production inspite of the fact that,

1. Northern states have contributed 37% to the national electronics production during 1996, and
2. States of Punjab and Haryana are otherwise most prosperous states of the country in terms of highest per capita income in 1995-96 (Economic Survey – 1996-97 of Government of India).

2.6 HYPOTHESES

After reviewing the above literature, following Hypotheses have been formulated:

1. The growth and development of electronics industry in Karnataka and Uttar Pradesh is better than the growth and development of electronics industry in Punjab and Haryana.

2. State policies for the Electronics and IT Industry formulated by the states of Karnataka, Uttar Pradesh, Punjab and Haryana are identical.
3. It is expected that better Institutional support is provided in the states of Karnataka and Uttar Pradesh to Electronics and IT Industry in comparison with the states of Punjab and Haryana.
4. Infrastructural facilities related to Electronics and IT Industry in Karnataka and Uttar Pradesh are better than those in the states of Punjab and Haryana.
5. Electronics and IT Industry in the states of Karnataka and Uttar Pradesh have better R&D facilities than those of the states of Punjab and Haryana.
6. There exists difference in the Human Resource Development related to Electronics and IT Industry in the four states of Karnataka, Uttar Pradesh, Punjab and Haryana.
7. Financial facilities available for Electronics and IT Industry in the states of Karnataka, Uttar Pradesh, Punjab and Haryana are similar.
8. Marketing strategies of Electronics and IT Industry in the states of Karnataka and Uttar Pradesh are better than those of Punjab and Haryana states.

CHAPTER - 3

METHOD AND PROCEDURE

This chapter describes the methodology in terms of the research design involving sampling, tools, questionnaire design, methods of collecting data and its analysis. The questionnaire, its validity and reliability and the techniques used for analysis of the final data are outlined. The methodology of the pilot and the main study is explained.

3.1 PLAN ADOPTED FOR RESEARCH STUDY

The methodology adopted for the study is summarized in a flowchart (see Figure 3.1).

3.2. SCHEMATIC CLASSIFICATION OF ELECTRONICS INDUSTRY

As the electronic products are numerous, some distinction is necessary to differentiate the products from one category to another. For identification of electronics items these are codified in a four level classification scheme developed by DBID (DoE, 1999). In this scheme, electronics items have been divided in nine major Groups as given in Table 3.1.

For convenience in this study, “Control, Instrumentation & Industrial Electronics” has been referred as “Industrial Electronics”, Data Processing & office Equipment as “Computer Hardware”, Communication & Broadcasting Equipment as “Communications”, Electronic Components plus Parts of Electronic Components as “Electronic Components”, in addition, a new group “Computer Software” has been considered which was earlier as part of miscellaneous group. Electronic Material and Miscellaneous groups have not found to be contributing significantly for the growth of the industry and therefore these have not been included in this study.

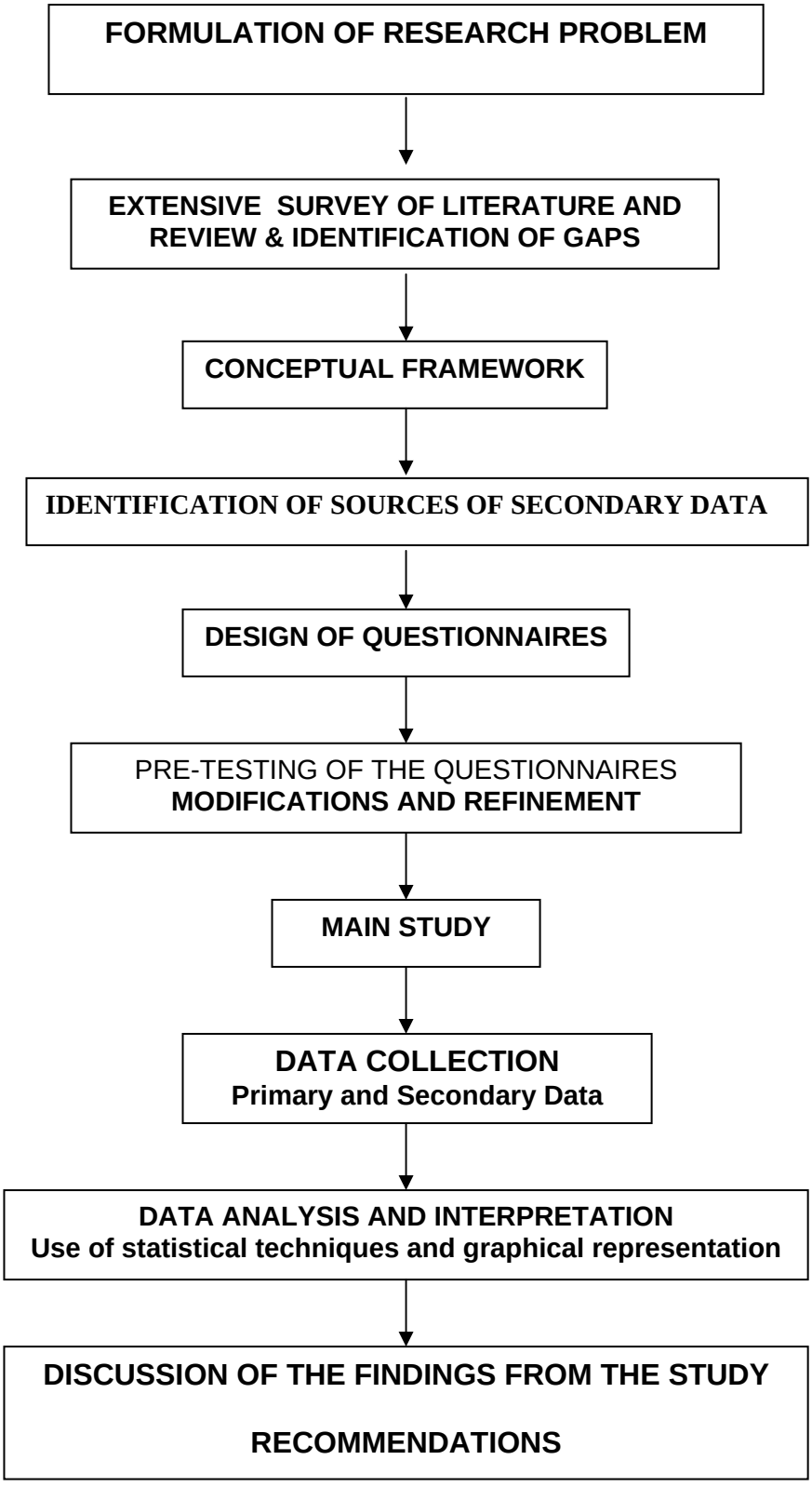


Figure 3.1 Flow-chart of Methodology

Table 3.1 Classification of Electronics Industry (Major Groups)

S. N	Code	Description	Nomenclature as referred in this study
1.	1000	Consumer Electronics	Consumer Electronics
2.	2000	Control, Instrumentation & Industrial Electronics	Industrial Electronics
3.	3000	Data Processing & Office Equipments	Computer Hardware
4.	4000	Communication & Broadcast Equipment.	Communication
5.	5000	Strategic Electronics	Strategic Electronics
6.	6000	Electronic Components	Electronic Components
7.	7000	Parts of Electronic Components	Electronic Components
8.	8000	Electronic Materials	Not considered in this study
9.	9000	Miscellaneous items used by the Electronics Industry.	Not considered in this study
10	-	-	Computer Software.

Each major group is divided into groups, the maximum number of which is eight. The ninth group under each major group is reserved for non-specified items falling under the major group. The same scheme is followed in all other lower levels of classification. The groups are further divided into sub-groups and sub-groups into classes. The actual item description /details are also retained along with the code of that class which can be retrieved as and when details are required. The brief description of the sub-groups that fall under major groups is given in Table 3.2.

The details of all items that fall under various sub-groups and classes are not given as the list is vast and can be referred in the literature titled “Guide to Electronics Industry in India – 1997 and 1999” published by the Data Base Information Division of Department of Electronics, Govt. of India, (DoE,1999).

Table 3.2 Classification of Electronics Industry (Sub-groups)

S.N.	Major Group	Sub-Groups
1.	Consumer Electronics	Audio & Video Equipments Audio Visual Equipment Consumer Electronic items, others.
2.	Industrial Electronics	Test and Measuring Instruments Medical Electronics Equipments Analytical Instrument Special Application Instruments Industrial Electronic & Automation Equipment. Process Control Equipment Office & Miscelaneous Electronic Equipments
3.	Computer Hardware	Computer Systems and Peripherals Microprocessor Based Systems Computer Peripherals.
4.	Communication	Switching, Transmission & Signaling Equipments Allied Communication Equipment Broadcasting Equipment.
5.	Strategic Electronics	Radar Systems & Navigational Equipment Underwater & Sonar Systems Electronic Warfare Equipment Defence Communication Equipment
6.	Electronic Components	Electron Tubes & Semiconductor Devices Passive & Electromechanical Components Special Components Electronic Components, other parts of item falling under, above six sub-groups.
7.	Electronic Materials	Metals and Alloys Ultra pure & special materials Chemicals, Plastics & Polymers Glasses & Ceramics Insulators, Electronic Materials, others.
8.	Computer Software	Domestic Software & Export Software.

3.3. SCOPE OF THE STUDY

In view of the objectives of this study two states, Karnataka and U.P. have been chosen as developed states and Punjab and Haryana have been taken as deficient states as far as the development of Electronics and Information Technology industry is concerned.

The Electronic and IT industry, as per the Department of Information Technology, Govt. of India is basically classified into seven groups namely: Consumer Electronics, Electronic Component, Industrial Electronics, Strategic Electronics, Computer Hardware, Computer Software and Communication& Telecommunication.

As the study is more Macro-analytical, all past and present quantitative and qualitative information was collected and analysis is based on primary as well as secondary data. As the data is acquired from different published sources it may suffer from all deficiencies related with a secondary data. However, tremendous and exhaustive efforts have been applied to collect data published by known and reliable organizations. The present study makes use of primary data for identification of factors inhibit promoting growth of industry in sampled states. The scientific breakthrough and micro level invention & developments were not the focus of this study.

3.4 SAMPLING PLAN

3.4.1 Sample Size

Electronics and Software Units

The sample comprised electronics manufacturing and software units in two high growth states of Karnataka and Uttar Pradesh and two low growth states of Punjab and Haryana. It has been found that Electronic and IT industry in India is mainly located in specific regions in a state. The study therefore is confined to locations in the four cities as given below.

All the 287 electronic manufacturing and 96 software export companies and 7 experts were covered for collection of data. Only those units registered as 'Limited' and 'Private Limited' companies and in operation at-least for a year at the time of collection of data were considered for this study. In case of software industry, only software export units were considered.

Karnataka

(88 Electronic Manufacturing and 34 Software Export Companies**)**

The major industrial hubs in Karnataka are located in Bangalore, Hubli, Mysore and Mangalore. However, Bangalore is the center for the electronics and IT industry in the state. As per Cliknet-1998, 96.3% of total 338 electronics manufacturing (Limited and Private Limited) companies of Karnataka were found to be based in Bangalore. In addition, as per directory published by STPI, Government of India dated 6-6-1998, out of total 240 software units registered under the STP scheme in the state of Karnataka, all except 2 units were found to be located in Bangalore. The electronics and IT units in Bangalore are concentrated in clusters mainly at Keonics Electronics City, International Technology Park, Raheja Towers and Maridian Towers on MG Road and STPI complex. Hence, growth of electronics and software export units operating in these locations will represent growth of this Industry in the state of Karnataka.

Therefore, all electronics manufacturing and IT units which qualify as per the definition explained above and are operating in the above locations in Bangalore have been included in the sample for study.

Uttar Pradesh

(76 Electronic Manufacturing & 38 Software Export Companies**)**

Kanpur, Varanasi, Bareilly, Lucknow, Agra, Ghaziabad and Noida are the major industrial locations in the state. In Uttar Pradesh, only one out of the total 38 STP units was seen to have its location outside Noida. Also, all except 36 electronics manufacturing units (70%) are operating in Noida. Hence, growth of electronics and software export units operating in Noida will represent growth of this Industry in the state of Uttar Pradesh. Electronics and Software units of the state of Uttar Pradesh are concentrated in Noida. Most of these units are located in Electronics City, STPI Complex and Noida Export Processing Zone (NEPZ) and remaining units are scattered throughout the city of Noida. All electronics manufacturing and STP units which qualify as per the definition explained above and are operating in above locations as well as those scattered in the city in Noida have been included in the sample for study.

Punjab

(80 Electronic Manufacturing, 9 Software Exporters and 5 Experts**)**

Punjab's Industries are mainly located in Ludhiana, Jalandhar, Amritsar and Mohali. Electronics and IT industry are clustered in Mohali. Majority of these units were found to be operating at ELTOP (Electronics Township of Punjab) complex and remaining units scattered throughout the city. All except one out of 24 software export units registered in Punjab were found to be located either in Mohali or Chandigarh. Also, all except 4 electronics manufacturing units (95%) are operating in Mohali. Hence, growth of electronics and software export units operating in Mohali (and Chandigarh in case of software export units) will represent growth of this Industry in the state of Punjab. Therefore, all electronics manufacturing and IT units which qualify as per the definition explained above and are operating in ELTOP complex as well as those scattered in the city in Mohali (and Chandigarh in case of software export units) have been included in the sample for study.

Haryana

(43 Electronic Manufacturing, 15 Software Exporters and 2 Experts**)**

In Haryana, Faridabad, Hisar, Bahadurgarh, Ambala and Gurgaon are established industrial towns. All the 15 software exporters registered in Haryana state were found to have their base in Gurgaon. In addition, as per database provided by the

Department of Industries, Government of Haryana, supplemented with Industrial directory of Gurgaon, out of total about 94 electronics manufacturing units in the state, 76 were found to have their base in Gurgaon. Remaining 18 units were scattered in Faridabad, Panchkula and Rewari. Gurgaon with about 80% electronics manufacturing units has become the hub of electronics & IT industry. These units are located in Electronics City, STPI Complex, Udyog Vihar and other areas in the city. Hence, growth of electronics and software export units operating in these locations in Gurgaon will represent growth of this Industry in the state of Haryana. Therefore, all electronics manufacturing and IT units which qualify as per the definition explained above and are operating in above locations as well as those scattered in the city in Gurgaon have been included in the sample for study.

Table 3.3 Sample States, Locations and Sampling Frame for Electronics and Software Industry

State	Location	Industry	Source of list of Units
Karnataka (Bangalore)	Keonics Electronics City	Electronics industry & Software industry	"Electronics City Industries Status Report" dated 3-2-99 issued by KEONICS.
	International Technology Park, Whildfield	Software Industry	• Directory published by STPI, Government of India dated 6-6-1998.
	M.G.Road • Raheja Tower • Maridian Tower	Software Industry	• Directory published by STPI, Government of India dated 6-6-1998.
	STPI Complex	Software Industry	"List of software export units registered with STPI, Bangalore as on 29-9-1998" issued by the STPI, Bangalore.
Uttar Pradesh (Noida)	Electronics City	Electronics Industry	Noida Industrial Directory (1996) published by Noida Entrepreneurs Association
	STPI Complex	Software Industry	Directory published by STPI, Government of India dated 6-6-1998.
	NEPZ	Electronics Industry & Software Industry	NEPZ Directory (1997) published by the Noida EPZ, Govt. of India.
	Noida Locations other than those mentioned above	Electronics Industry & Software Industry	Noida Industrial Directory (1996) publishhed by Noida Entrepreneurs Association.
Punjab (Mohali)	ELTOP	Electronics Industry & Software Industry	• Report on "Status of units in ELTOP, Mohali" dated 7-1-1998 issued by DGM(E), PSEDPCL. • Directory published by STPI, Government of India dated 6-6-1998. • Report on "Status of Software export units listed at PSEDPCL for STPI-Mohali" dated 18-7-1998 issued by GM, PSEDPCL.
	Chandigarh	Software units working under STPI, Mohali	Same as above
Haryana (Gurgaon)	Electronics City	Electronics Industry & Software Industry	• Industrial Directory of Udyog Vihar & Sector-18 (Electronics City), Gurgaon published by Udyog Vihar Industrial Association (1998). • Database of Industries in Haryana by state government, 1997-98. • "List of units set up /being Set up in Electronics City, Gurgaon (1997)" supplied by HARTRON office located in Electronics City, Gurgaon. • Directory published by STPI, Government of India dated 6-6-1998.
	STPI Complex	Software Industry working under STPI scheme and located in Gurgaon	Same as above
	Udyog Vihar, Industrial Area	Electronics Industry & Software Industry	Same as above

Experts from Electronics and Software Industry

Seven experts were selected from the states of Punjab and Haryana having rich experience in the field of electronics/IT manufacturing (4 experts) and software exports (3 experts). One expert from each sector i.e. Electronics Industry (Lt. Col. Inderjit Singh) and Software Industry (Brig. S.S. Sahney) were selected who were having long experience in manufacturing /software development and were also having recognition in the field with various successful assignments to their credit at the state level as adviser /consultant to the Government as well as Industry. One expert from each sector i.e. Electronics sector (Mr. Sandeep Kapur) and Software sector (Mr. Rakesh Agrawal) were selected who were engaged in state level policy formulation for electronics sector and developments in regard to Industry specific infrastructure and investment projects. Expert one each from strategic planning/Marketing (Mr. S.K.Amberdar) and Production (Mr. A.K.Pathak) in large manufacturing company(s) was also included in the sample. Dr. Sanjay Tyagi was included in the sample as an expert for his contribution in implementing Software Technology Parks scheme of Government of India in Uttar Pradesh at NOIDA and in Punjab at Mohali. Detailed list of the experts with their expertise and official status is given in Annexure – V.

Details regarding locations of electronics and IT industrial hubs and sources of list of electronics manufacturing and software export units scattered in selected locations considered for the sample for study are presented through Table 3.3.

3.5 Data Collection

Primary data collected for the present study was restricted to sample states mentioned in section 3.4. Selection of the sample was purposive and based on the judgment.

3.5.1 Primary Data

A) Respondents

Electronics and Software Units

In each of the sample states, major city and therein areas where electronics and software units are concentrated was identified and all the units therein were covered for collection of data. The electronics and Software industrial hubs in states under study along with source of sample frame are shown in Table 3.3. Only those units registered as 'Limited' and 'Private Limited' companies and in operation at least for a year at the time of collection of data were considered for this study. In case of software industry, only software export units were considered.

Experts from Electronics and Software Industry

Experts include professionals and engineers having senior positions in electronics manufacturing, Software Exports, State Electronics Development Corporation, Software Technology Parks of India

B) Tools

Separate pre-tested questionnaires were designed for Electronic units, Software Export units, Experts from electronics Industry and Experts from software Industry. The questionnaires were pre-tested for clarity on six respondents (two from electronics manufacturing units, two from software export units, one expert from STPI, Mohali and one expert from electronic unit based in Chandigarh). Improved questionnaires were used for final collection of data.

With a view to understand the rationale and also to ascertain reliability of data gathered through secondary sources, personal visits to all the units covered under the sample were made by the investigator. Copies of questionnaires used for collecting primary data from Electronics Units, Software

Units, Experts from Electronics Industry and Expert from Software Industry are show in Appendices I, II, III and IV.

C) Administration

Electronic and Software Export Units

The investigator personally administered the questionnaires. The details of the total units in the sample, the status and response therein are shown in Table 3.4 and 3.5.

Table 3.4 Sample Distribution of Electronic Manufacturing Units

State/Location	Units visited personally	Units found closed	Non-electronic units	Units not responded	Units responded	Units actually filled up Q.	% Units actually filled up Questionnaire
Karnataka (Bangalore)	88	37	7	21	23	8	18.2
U.P. (Noida)	76	26	12	16	22	9	23.7
Punjab (Mohali)	80	44	25	1	10	4	36.4
Haryana (Gurgaon)	43	11	9	0	23	8	34.8
TOTAL	287	118	53	38	78	29	25.0

Source:

Karnataka - Electronics City Industries Status Report dated 3.2.99 issued by KEONICS

U.P. - Noida Industrial Directory (1996) published by Noida Entrepreneurs Association, and
- NEPZ Directory (1997) published by the Noida EPZ, Govt. of India.
- List of STP units operated under jurisdiction of STPI Noida (1998)

Punjab - Report on “Status of units in ELTOP, Mohali” dated 7-1-1998 issued by PSEDPCL.

Haryana - Industrial Directory of Udyog Vihar & Sector-18 (Electronics City), Gurgaon published by Udyog Vihar Industrial Association (1998)
- “List of units set up /being Set up in Electronics City, Gurgaon (1997) “ supplied by HARTRON office located in Electronics City, Gurgaon.

Table 3.5 Sample Distribution of Software Export Units.

State Location	Units visited personally	Units found closed	Units not responded	Units responded	Units actually filled up Questionnaire	% Units actually filled up Questionnaire
Karnataka (Bangalore)	34	5	3	26	13	44.8
U.P. (Noida**)**	38	11	11	16	8	29.6
Punjab* (Mohali**)**	9	1	-	8	6	75.0
Haryana (Gurgaon**)**	15	1	5	9	3	21.4
TOTAL	96	18	19	59	30	38.5

***** Software export units registered under STP scheme at Mohali while actually operating at that time from various locations in Mohali and Chandigarh.

Source:

- Directory published by STPI, Government of India dated 6-6-1998.
- STPI Centres located in Bangalore, Noida, Mohali and Gurgaon.

Experts from Electronics and Software Industry

In all seven experts were interviewed including four from electronic Industry and three from Software Industry. The state-wise break up is shown in Table 3.6. Detailed list of the experts with their expertise and official status is given in Annexure – V.

Table 3.6 Sample Distribution of Experts from Electronics & Software Industry

State/Location	Electronics Expert	Software Expert
Punjab (Mohali)	03	02
Haryana (Gurgaon**)**	01	01
TOTAL	04	03

The list of Electronics Units, Software Units and Experts from whom filled-up questionnaires were collected / received during the study is given in Appendix V. The schedule of personal visits by the investigator in the sample states is given in Appendix VI.

3.5.2 Secondary Data

The major source of Secondary data was publications of government agencies like the Department of Information Technology, Electronics & Computer Software Export Promotion Council, Software Technology Parks of India, State government official websites and Year book of world electronics data 2001/2002 from Reed Electronics Research, U.K. Time period from 1992 to 2002 was covered for the purpose of collecting data. However, due to non-availability of data, in case of data related to states, a period from 1992 to 1999 was considered. Table 3.7 gives details in regards to the sources of secondary data collection for the study.

Table 3.7 Sources of Secondary Data Collected For the Study.

S. N	Source	Publication
1	Department of Information Technology, Government of India	• Annual reports of the years 1996-97, 1997-98, 1998-99, 1999-00, 2000-01 and 2001-02. • Guide to Electronics Industry in India – 1997 and 1999, DoE Publication, 1999 • Ninth Five year plan (1997-2002) “, 1996. • Journal :Electronics Information & Planning, Vol.21,No3; Vol.22,No3; Vol.23,No4; Vol.26,No12; Vol.27,No12; Vol.28,No.6-7. • Data Bank & Information Division as an authentic source for data related to electronics and software production at national and state level.
2	Electronics & Computer Software Export Promotion Council, Ministry of Commerce,	• Annual reports of the years 1996-97, 1997-98, 1998-99, 1999-00, 2000-01 and 2001-02. • Statistical Year Book of Indian IT and electronics Industry, 2000-01. • Statistical Year Book of Indian IT and

	Government of India	electronics Industry, 2001-02.
3	Software Technology Parks of India, DIT, Government of India.	Software Technology Parks of India, and NASSCOM, India: Software Development Centres – A compendium on Government Policy, procedure and Guidelines, 1996.
4	Official website	• Department of Information Technology, GoI • Electronics and Computer Software Export Promotion Council, GoI • Software Technology Parks of India, GoI • NASSCOM and MAIT • State government websites of Punjab, Haryana, Karnataka and Uttar Pradesh
5	Punjab State	Annual reports of SEDC for the year 1996-97 and 1997-98.
6	Haryana State	Annual reports of SEDC for the year 1996-97 and 1997-98.
7	Karnataka	Annual reports of SEDC for the year 1996-97 and 1997-98.
8	Uttar Pradesh	Annual reports of SEDC for the year 1996-97 and 1997-98.

3.6 DATA ANALYSIS

Secondary Data

The time series data were duly classified for the proposed period. Simple statistical techniques involving use of scatter line diagram, histogram, simple and compound growth rate and wherever required fitting of curve were used for drawing inferences.

The compound average growth rate (CAGR) was calculated by using the formulae:

r = exp ln { (Xn / X0)1/n - 1 }

where, n = 0,1,2,3,4, ……., and

‘ r ’ denotes compound average growth rate.

The CAGR, r only depends on the variable at two points in time and is independent of what happens between these two points.

Primary Data

The data received through questionnaires from Electronics and IT Industry and Experts from the industry was classified and tabulated. Quantitative and Qualitative analysis was done and inferences were drawn in line with objective of the study.

3.7 CONCLUSION

This chapter delineates the methodology in terms of the research design, sampling design, questionnaire design, methods of data collection and the analysis of data. The research design described the conceptual framework within which the research study has been conducted. The pre-testing of the questionnaires, their validity and the techniques used for analysis of the final data are outlined. The chapter explained the methodology of the pilot and the main study and also highlights the methods and techniques used for the analysis of data.

CHAPTER - 4

PERFORMANCE ANALYSIS OF INDIAN ELECTRONICS AND I.T. INDUSTRY

Policy initiatives for Indian electronics industry introduced since 1991 have resulted in greater technological advancement and increased international competitiveness of the Indian Electronics and I.T. sector. Except in the area of aerospace and military equipment manufacturing, industrial licensing has been abolished for the electronics industry. This sector has been playing a significant role in the Indian economy and has emerged as the fastest growing segment of Indian Industry both at national and international levels. This chapter is devoted to in-depth study and analysis of growth in electronics and IT industry in India.

4.1 GROWTH OF ELECTRONICS INDUSTRY IN INDIA

Growth in national electronics production during Sixth Plan (1980-85), Seventh Plan (1985-90), Eighth Plan (1992-97) and Ninth Plan (1997-02) and its deviation from targets have been analysed. Performance of electronics and I.T. exports from India and growth in each segment have been discussed in detail and findings explained in length. Annual reports of various period and other publications of the Department of Information Technology, Government of India have been the main source of data used for analysis in this chapter.

4.1.1 Performance in Electronics and IT production

In Industrial Policy of 1991, India has identified electronic goods and software as thrust areas for exports and this initiative has resulted in tremendous growth in electronics and software export from India during initial years.

During various five year Plans, India has been putting its maximum attention to reduce cost of indigenously produced components and equipments and to strengthen in-house R&D efforts. The main target has been set to achieve production levels in Indian electronics industry at near international costs and prices.

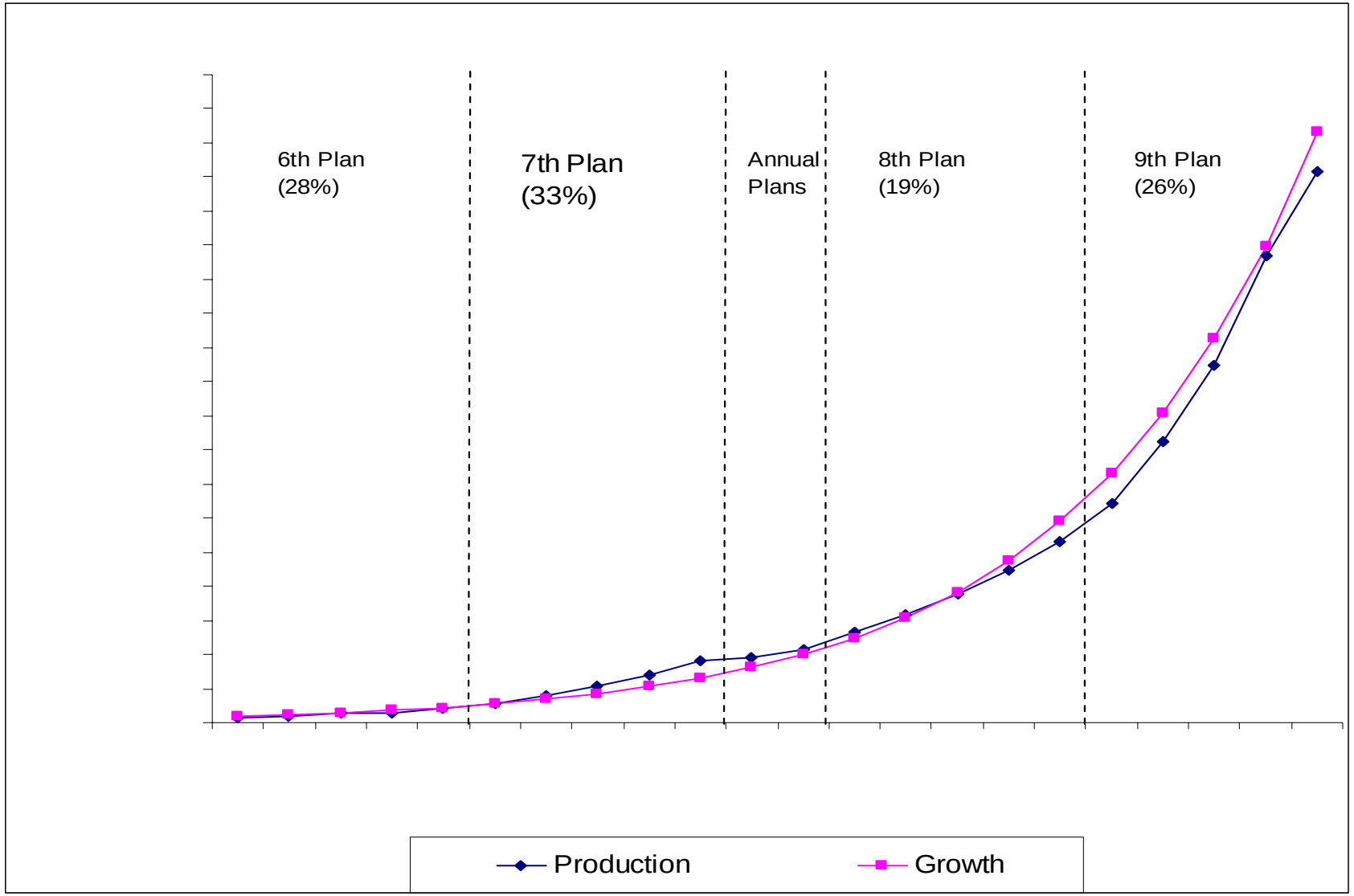


Figure 4.1 Growth Trend in Electronics Production During the Five Year Plans

Investigations show that during the VI Plan (1980-85) the electronics Industry achieved a compound annual growth of 28% in production raising it to 33% during VII Plan (1986-91). However, it fell to 19% during VIII (1992-97) and further recorded a higher growth at 26% during IX Plan (1997-02). Figure 4.1 predicts a sharp rising trend during X plan. The production and growth trends in this sector during various plans are presented through Table 4.1.

Table 4.1 Growth Trend in Electronics Industry During Five Year Plans

(Value in Rs. Million**)**

Plan	Period	Production	CAGR (%)
VI Plan	1980-81 to 1984-85	65650	**28%**
VII Plan	1985-86 to 1989-90	280600	**33%**
Annual Plan	1990-91	95400	5.9%
Annual Plan	1991-92	106750	11.9%
VIII Plan	1992-93 to 1996-97	967950	**19%**
IX Plan	1997-98 to 2001-02	2749940	**26%**

Source: Data related to VI and VII has been taken from Ninth Five Year Plan (Electronics Industry) of DIT and for VIII and IX plan taken from Annual report-2001-02 of DIT.

Table 4.2 Level of Fulfillment of Targets of Electronics Production During Eighth and Ninth Plans

(Value in Rs. Millions)

Year	**VIII Plan (1992-93 to 1996-97)**					**Year**	**IX Plan (1997-98 to 2001-02)**				
	Targets		Actual Production		% Fulfillment		Targets		Actual Production		% Fulfillment
	Value	Growth %	Value	Growth %			Value	Growth %	Value	Growth %	
91-92	- Base Year --		106750	11.9		96-97	- Base Year -		266400	19.3	-
92-93	125000	17.6	132000	23.7	105.6	97-98	399000	50	320700	20.4	80.4
93-94	162000	29.6	157850	19.6	97.4	98-99	533000	33.6	411400	28.3	77.2
94-95	199000	29.8	188300	19.3	94.6	99-00	721000	35.3	524500	27.5	72.8
95-96	273500	37.4	223400	18.6	81.7	00-01	991500	37.5	684500	30.5	69.0
96-97	360000	31.6	266400	19.3	74.0	01-02	1383500	39.5	808840	18.2	58.5
CAGR	1119500	30.27	967950	19.9	86.5	**CAGR**	4028000	36.5	2749940	26.0	68.3

- Actual production also includes Domestic software for which no target was set.
- Source : Ninth and Tenth Five Year Plans of DIT.

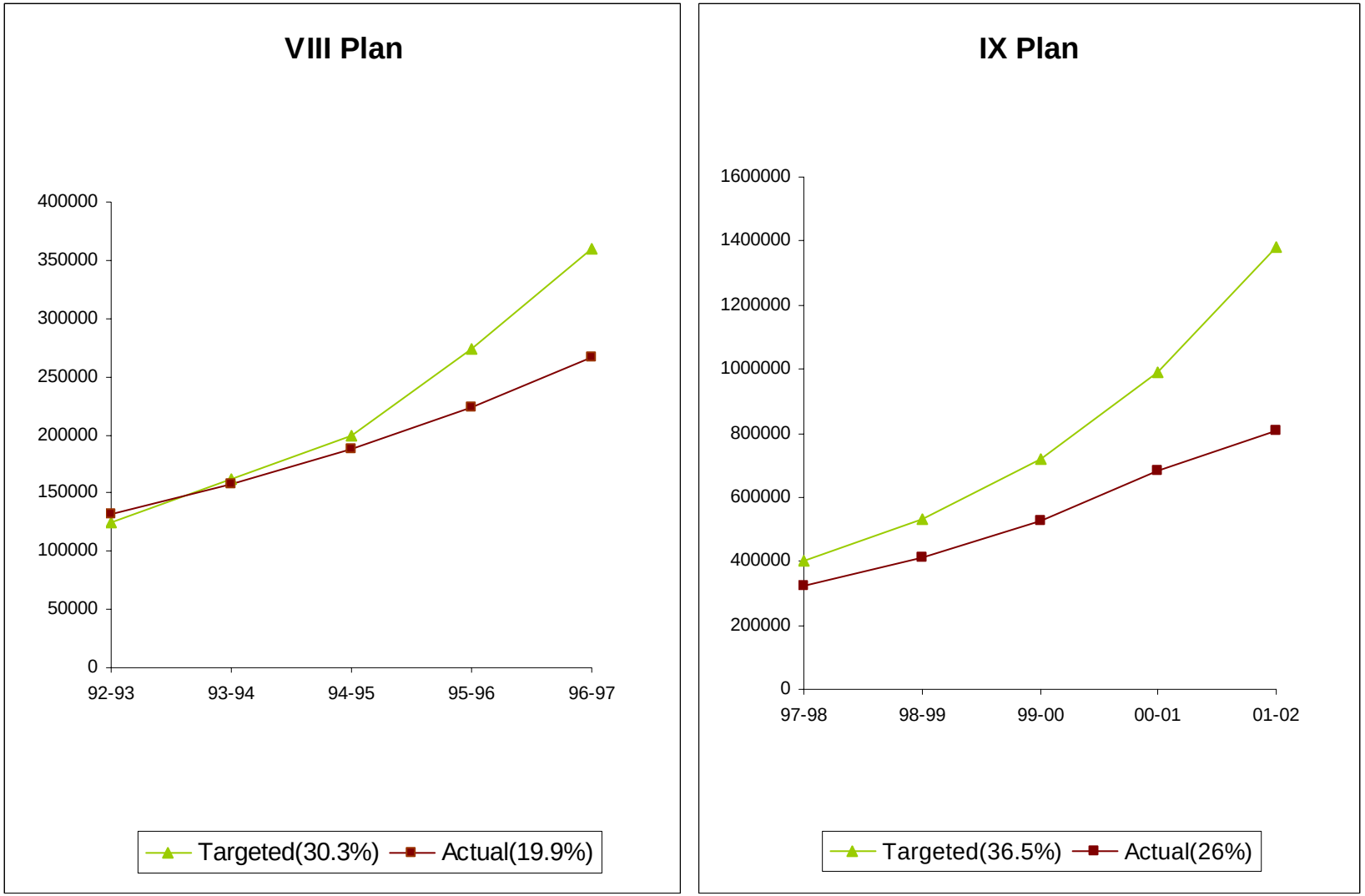


Figure 4.2 Achievements Against Targets in Electronics Production During Five Year Plans

Table 4.2 and Figure 4.2 indicate the year-wise fulfillment of target for the last two plans i.e. VIII and IX plans. The electronics growth during the VIII and IX Plans has found to be much below the targets. Only in 1992-93 the production value was above the target.

During 1992-93, the production of electronics achieved was Rs. 132000 millions as against a target of Rs. 125000 millions recording a fulfillment of 105.6%. Fulfillment of targets has shown a downward trend in all subsequent years till the end of VIII Plan. The fulfillment varied from 105% in 1992-93 to 74% in 1996-97 showing a continuous downward trend during the plan period. A similar downward trend was observed in the IX plan varying from 80.4% in 1997-98 to 58.5% in 2001-02 (Table 4.3). Thus, fulfillment of targets during VIII and IX Plans has shown downward trends throughout. The analysis is evident from Figure 4.2. The graph indicate that achievements during initial years of the plans are close to targets and thereby continuously decline as the plan period moves towards its end. Some of the reasons for this phenomenon could be:

i) Limitation of forecasting.

It is easy to forecast the short term demand on the basis of trend and near certainties than to forecast the long term demand which involves changes in factors and events at national and international level beyond prediction.

ii) Targets and Policy

Setting of targets and policy measures with respect to industrial and EXIM policy etc. are likely to match in the initial years but there is bound to be a lag in policy changes to the ever changing national and international political and economic situation & market.

The sectoral analysis of electronics industry as shown in Table 4.3 reveals that the electronics hardware production of Rs. 120350 million in 1992-93 increased to Rs. 203400 million in the terminal year of VIII Plan i.e. 1996-97 registering a compound growth rate of 14.02% which declined to 10.3% during next five years with a production of Rs. 327500 million in 2001-02.

S.N.	Sector	VIII Plan						IX Plan						CAGR 1992-93 to 2001-02 (%)
		92-93	93-94	94-95	95-96	96-97	VIII Plan CAGR (%)	97-98	98-99	99-00	00-01	01-02*	IX Plan CAGR (%)	
1.	Consumer Electronics	33600	41500	46650	58000	65000	**17.9**	76000	92000	112000	115500	127000	**13.7**	**15.9**
2.	Industrial Electronics	17200	17700	21100	29000	31000	**15.9**	31500	33000	37500	40000	45000	**9.3**	**11.3**
3.	Computer Hardware	15300	18200	24500	22250	27400	**15.7**	28000	23000	25000	34000	35500	**6.1**	**9.8**
4.	Communication	28000	31500	32500	26000	30000	**1.73**	32500	44000	40000	45000	45000	**8.5**	**5.4**
5.	Strategic Electronics	3850	5000	6000	10750	13000	**35.6**	9000	13000	14500	17500	18000	**18.9**	**18.7**
6.	Electronics Components	22400	26800	31500	35000	37000	**13.4**	44000	47500	52000	55000	57000	**6.7**	**10.9**
	Total Electronics Production	120350	140700	162250	181000	203400	**14.02**	221000	252500	281000	307000	327500	**10.3**	**11.8**
7	Domestic Software	4900	6950	10700	16900	26000	**51.8**	34700	49500	72000	94000	116340	**35.3**	**42.2**
8.	Software Export	6750	10200	15350	25500	37000	**53.1**	65000	109400	171500	283500	365000	**53.9**	**55.8**
	Total Software	11650	17150	26050	42400	63000	**52.5**	99700	158900	243500	377500	481340	**48.2**	**51.2**
	Total Electronics & I.T. Production	132000	157850	188300	223400	266400	**19.2**	320700	411400	524500	684500	808840	**26.0**	**22.3**

*Estimated Source: Annual Report-2001-02 of DIT.

Table 4.3 Growth Trend in Sectorwise Production in Electronics Industry Since Year 1992-93 Onwards (Value in Rs. Million)

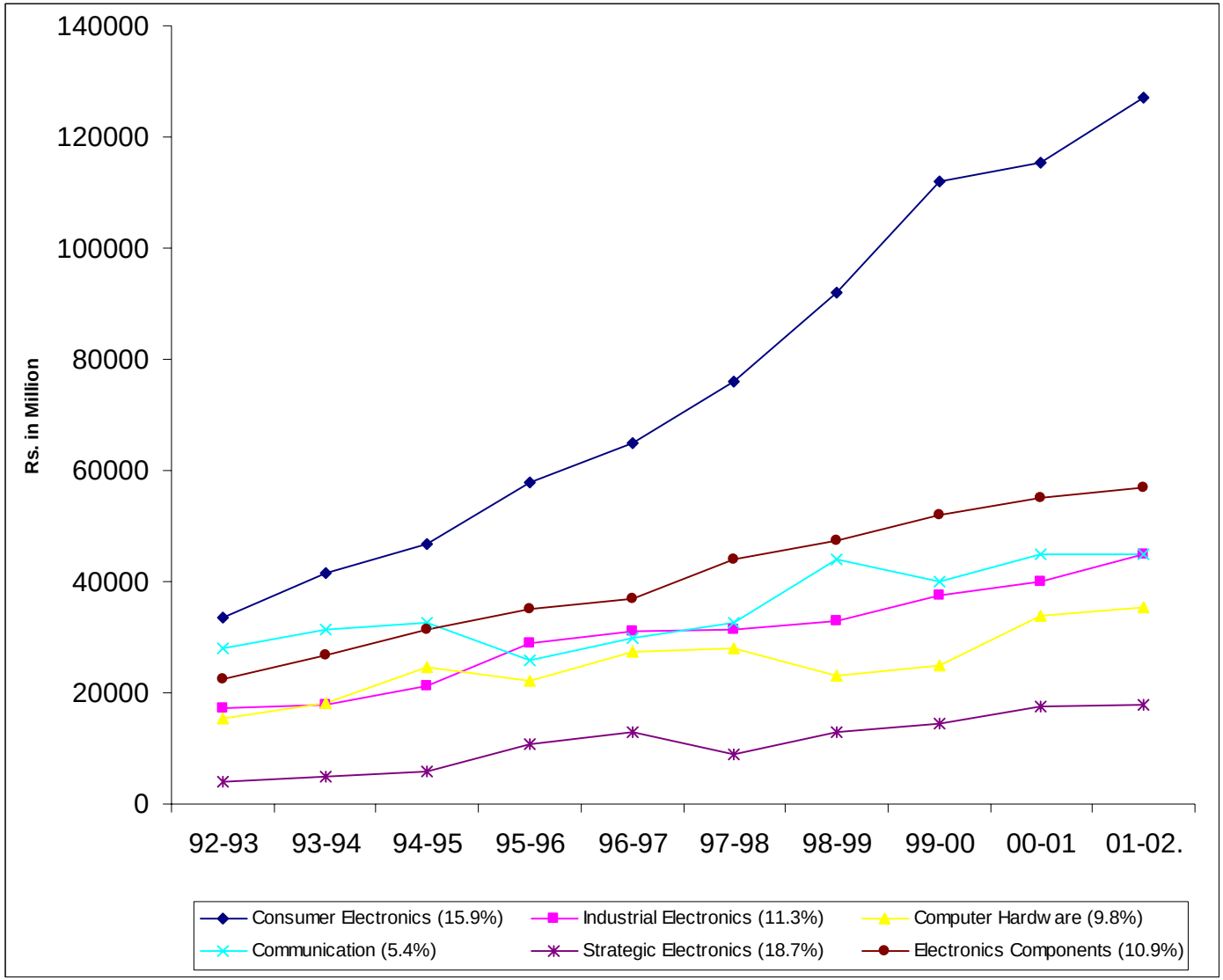


Figure 4.3 Sectoral Growth Trend in Electronics Production

Electronics and software combined have recorded a CGAR of 19.2% during first five years from 1992-93 and then during eighth five- year plan which increased to 26% by the end of IX plan. Figure 4.3 shows a sharp growth in consumer electronics in India having the highest contribution in total electronics hardware production among different segments. This segment has the potential to grow in India like software segment. It is further observed that percentage of software production to total electronics & IT production increased from 8.8% in 1992-93 to 59.5% in 2001-02.

4.1.2 Growth in Electronics and IT Exports

Electronics and I.T. exports together recorded a compounded annual growth rate of 44% during VII and VIII plans which increased to 45% in IX Plan. Software exports improved during IX Plan increasing exports from Rs. 94800 million (CAGR 53%) in VIII Plan to Rs. 994400 million (CAGR 54%) in IX Plan. However, during VIII Plan, electronics hardware exports registered a lower CAGR of 35% which declined to 18% during IX Plan. A sharp decline in exports of all the segments of electronics hardware during period 1998-99 to 1999-2000 is clearly visible in Figure 4.4. Distorted tariff structure and high cost of finance caused poor performance of this sector. It has also been noted that India's overall export growth declined sharply in 1998-99 on account of South East Asia crisis and global economic slowdown. As per WTO International Trade Statistics (2001), Export growth rates of World and India sharply declined and became negative to 1.63 and 4.48 respectively during 1998-99. Performance of electronics and software exports during last two plans are presented below through Table 4.4.

Table 4.4 Performance of Electronics Exports During VIII and IX Plans

(Value in Rs. Million **)**

Plan	**Period**	**Electronic Exports**	**Software Exports**	**Electronic & IT exports**	**CAGR (%)**		
					Electronics	Software	Electronics and IT
EIGHTH	1992-93 to 1996-97	80060	94800	174860	35%	53%	44%
NINTH	1997-98 to 2001-02	194880	994400	1189280	18%	54%	45%

Note: Calculations are based on data taken from table 4.5 of this thesis.

Table 4.5 : Growth Trend in Sectorwise Exports in Electronics Industry During Post-liberalisation Phase

(Value in Rs. Million)

SN	Sector	92-93	93-94	94-95	95-96	96-97	CAGR (%)	97-98	98-99	99-00	00-01	01-02	CAGR (%)	CAGR from 92-93 to 2001-02 (%)
1	Consumer Electronics	1850	2500	3210	4300	5350	**30.4**	6000	4000	3000	6480	7000	**3.9**	**15.93**
2	Industrial Electronics	1050	1150	1250	1400	1700	**12.8**	2000	1600	2000	5000	9500	**47.6**	**27.73**
3	Computer Hardware	2600	4200	6000	7750	9320	**37.6**	12500	4000	2400	12500	18000	**9.5**	**23.98**
4	Communication	240	580	1310	3100	4000	**102.1**	1000	700	500	5500	1500	**10.7**	**22.58**
5	Strategic Electronics	50	400	200	200	300	**56.5**	100	100	100	-	710	**63.2**	**34.29**
6	Electronics Component	2000	2250	3000	3600	5200	**26.9**	8400	7600	6000	18400	22000	**27.2**	**30.53**
	Total Electronic Exports	**7790**	**11080**	**14970**	**20350**	**25870**	**35.0**	**30000**	**18000**	**14000**	**47880**	**58710**	**18.2**	**25.16**
7	Software Export	6750	10200	15350	25500	37000	**53.0**	65000	109400	171500	283500	365000	**53.9**	**55.80**
8	**Total Electronic & IT Export**	**14540**	**21280**	**30320**	**45850**	**62870**	**44.2**	**95000**	**127400**	**185500**	**331380**	**423710**	**45.3**	**45.45**
	Growth (%) Annual	28.3	46.4	42.5	51.2	37.1		51.1	34.1	45.6	78.6	46.3		5.62

Note: Software export does not include telecom services / project Export / VSNL services.

Source : Data has been taken from Annual Report-2001-02 pertaining to all years except 2001-02 which was taken from Statistical Year Book-2001-02 of ESC.

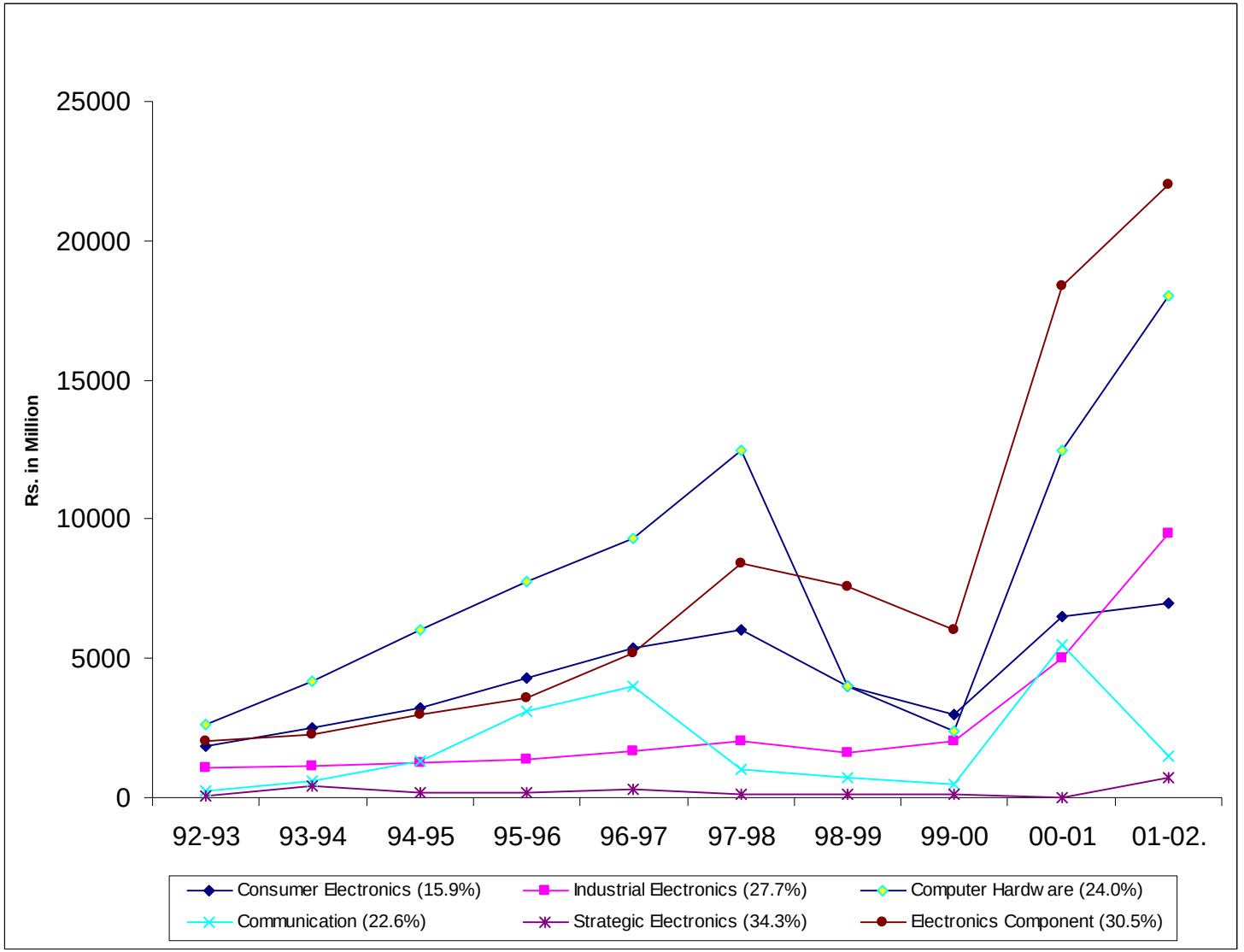


Figure 4.4 Sectoral Growth Trend in Electronics Exports

Table 4.5 and Figure 4.4 point out the sectoral growth trend in exports. Total electronics exports of Rs.14540 millions in 1992-93 increased to Rs. 62870 million in 1996-97 showing a CAGR of 44.2%. During IX Plan, total exports of electronics and IT production increased from Rs. 95000 million to Rs. 243710 million achieving a CAGR of 45.3%.

The CAGR in exports over the period 1992-93 to 2001-02 was more in case of strategic electronics (33.4%) followed by electronics components (30.5%), industrial electronics (27.7%), computer hardware (24%), communication (22.6%) and consumer electronics (15.9%). However, in terms of volume (Rupee value) the exports in 2001-02 were more for electronics components followed by computer hardware, industrial electronics, consumer electronics, communication and strategic electronics.

As can be seen from Figure 4.4 the total exports got a big boost in the year 1999-2000 onwards. One of the major reasons that can be attributed to it is a liberalized EXIM policy announced during that year. It is further observed that the percentage of software exports in total electronics and IT exports increased from 46.4% in 1992-93 to 86.1% in 2001-02. At the end of 2001-02 the software exports formed 45% of the total production of electronics and IT in the country.

Table 4.6 Exports to Production Ratio in Respect of the Four States

(Values in million)

	Average value for the Period 1992-93 to 2001-02			Period 2001-2002		
Sector	Production	Exports	Exports/ Production(%)	Production	Exports	Exports/ Production(%)
Consumer Electronics	76725	4369	5.6	127000	7000	5.5
Industrial Electronics	30300	2665	8.79	45000	9500	21.1
Computer Hardware	25315	7927	31.3	35500	18000	50.7
Communication	352150	1843	5.2	45000	1500	3.3
Strategic Electronics	11060	240	2.2	18000	710	3.9
Electronics Component	40820	7845	19.2	57000	22000	38.5
Software	152119	108920	71.6	481340	365000	75.8

Note: Calculations are based on data taken from table 4.3 and table 4.5 of this thesis.

4.1.3 Sectorwise Growth Trend in Electronics and IT Industry

Sector-wise exports to production ratio are shown in Table 4.6. The sectoral analysis based on Tables 4.3, 4.5 & 4.6 and Figures 4.3 & 4.4 is given below:

4.1.3.1 Consumer Electronics

It was observed that during nineties, consumer electronics sector in India grew at the highest rate. Production in this sector increased from Rs. 33600 million during 1992-93 to Rs. 127000 millions in 2001-02. During the same period national electronics hardware production increased from Rs. 120350 million to Rs. 327500 million as shown in Table 4.3. The analysis on the basis of Table 4.3, 4.5 and 4.6 is as follows:

a) Production of Consumer electronics had a CAGR of 15.9%, higher than the total national electronics hardware production CAGR of 11.8% and the highest among all the segments of the sector. The value of production has been highest for consumer electronics throughout the period from 1992-93 to 2000-01.
b) The industry attained a CAGR of 8.16% higher than that of the world growth rate of 6% during 1998-2001.
c) The share of consumer electronics in the total electronics hardware production increased significantly from 27.9% in 1992-93 to 38.8% in 2001-2002.
d) Exports of consumer electronics had a CAGR of 15.9%
e) The percentage share of exports to production has remained more or less constant at 5.5% of production.

However, as per data available at DIT; globally, the share of consumer electronics is only about 9% and is declining. India is presently in the growth phase in consumer electronics similar to what Japan was in the seventies and eighties with a share of 20-30%. **A high production volume and a low percentage of exports to production is an indication of high domestic demand**.

As per the Department of Information Technology, Government of India, India has about seven TV sets and 8 Radio receivers per 100 persons while China and Malaysia each have 32 TV sets per 100 persons and Malaysia and South Korea have 50 and 98.8 Radio receivers respectively.

A large manufacturing base exists for consumer electronics products in the country. Consumer Electronics Manufacturers have established themselves as suppliers of quality products. Some of the leading Indian Consumer Electronics Companies have established their own brand in the International Market. The others have established themselves as O.E.M suppliers.

Table 4.5 specify that exports of consumer electronics goods from India increased from Rs. 1850 million in 1992-93 to Rs. 6000 million in 1997-98 with a steady growth but then started declining with exports worth Rs. 4000 million in 1998-99 and Rs 3000 million in the year 1999-2000. The major items of export are black & white T.Vs, Colour TVs, VCRs/ VCPs, Tape recorders, Clocks, watches, amplifiers, Blank and Pre-recorded Audio / Video Cassettes and CDs. While exports are made to almost all parts of the globe, major destinations are Europe, South East Asia and Middle East Countries.

4.1.3.2 Industrial Electronics

The Industrial Electronics sector includes process control instrumentation, automation systems, Test & measuring instruments, Industrial Robotics and medical instruments. The use of electronic control and instrumentation results in productivity improvement, reduced maintenance costs and quality end products and consequently contributes in overall development of the core sector such as steel, mining, textile, jute, paper and pulp, etc.

Production in this sector increased from Rs. 17200 million during 1992-93 to Rs. 45000 millions in 2001-02. During the same period national electronics hardware production increased from Rs. 120350 million to Rs. 327500 million as shown in Table 4.4. The other important observations are as follows:

a) Industrial electronics production had CAGR of 11.3% and had a growth rate nearly the same as that of production of total national electronics hardware having a CAGR of 11.8%. The share of Industrial electronics in the total electronics hardware production has decreased from 14.3% in 1992-93 to 13.74% in 2001-02. Exports of industrial electronics had a CAGR of 27.7%.
b) Industrial electronics registered a growth rate of 7.56% higher than that of the world's growth rate of 4.09% during 1998-2001.
c) As can be seen from Figure 4.4 the rise in exports has been sharp since 1999-2000 onwards.
d) **A high export to production ratio of 21 percent is an indicator of high export demand in this sector.**

The rise in exports/production ratio may also be due to the duty free imports allowed to 100% exporting units.

There is a considerable gap, at present, between the level of automation existing in the Indian industries and that in the developed countries. Robotics technology is being extensively used globally while in India it is used only in a few industries for simple applications like welding, painting and material handling.

4.1.3.3 Computers Hardware

Production in this sector has increased from Rs. 15300 million during 1992-93 to Rs. 35500 million in 2001-02. With a CAGR of 9.8% electronics hardware production increased from Rs. 120350 million to Rs. 327500 million as shown in Table 4.4. The other observations are as follows:

a) Computer hardware production had a CAGR of 9.8% as against CAGR of 11.8% for total electronics hardware.
b) Exports in computer hardware have grown significantly from Rs. 2600 million in 1992-93 to Rs. 18000 million in 2001-02 giving a compounded annual growth rate of 24%.

c) The growth rate of this segment had a CAGR of 5.01% less than the world's CAGR of 9.25% during 1998-2001.
d) **The favorable export to production ratio of 50.7% in 2001-2002 is an indicator of export potential in this sector**.

The items of manufacture include range of computers, from personal computers, servers, workstations to high performance supercomputers, data processing equipment and peripherals such as, monitors, keyboards, disk drives, printers, power supplies, modems and networking products.

The Personal Computer market has increased significantly with about 800,000 PCs being sold in India during the year 1997-98. Of this, approximately 320,000 were manufactured locally. This has brought a PC penetration level to 0.2%. Prices have also relatively come down in consonance with the worldwide trend. There is large scope in export market.

4.1.3.4 Electronics Communications

A large variety of communication and broadcasting equipment is being manufactured indigenously which includes digital exchanges (EPABX, RAX, TAX and MAX), transmission equipment such as HF/VHF/Microwave transceivers, satellite communication terminals, optical fibber communication equipment, troposcatter equipment, two-way radio communication equipment etc.

Production in this sector increased from Rs. 28000 million during 1992-93 to Rs. 45000 million in 2001-02. During the same period, national electronics hardware production increased from Rs.120350 million to Rs.327500 million as shown in Table 4.4. This brings to three important features:

a) The growth in communication electronics had a CAGR 5.4% the lowest among the various sectors of electronics industry whereas the growth in national electronics hardware was recorded at 11.8% (CAGR). During 1995-96 and 1999-00 a negative growth was observed in this segment of the industry.

b) The industry achieved a negative growth rate of –1.83% during 1998-2001 as against the world's growth rate of 8.83%.

c) The share of communication electronics in the total electronics hardware production shows a declining trend from 23.3% in 1992-93 to 14.74% in 1996-97 to 13.74% in 2001-02.

d) Exports in electronics communication had a CAGR of 22.6% over the period 1992-93 to 2001-02. As can be seen from Figure 4.4 it has shown wide fluctuations with volumes being much higher than 2001-02 in 1995-96, 1996-97 and 2000-01 **indicating intense competition as one of the features in the export market.**

The Telecom Policy-99 effective from April 1,1999 seeks to significantly redefine the competitive nature of the telecom industry. Availability of affordable and effective communications for the citizens is at the core of the vision and goal of the telecom policy. It is now possible for private agencies to invest in telecom sector and opportunities are expanding in the areas of telecommunication, value added services and basic telephone services, cellular mobile radio (GSM), radio paging service and ISDN services, etc. This sector is expected to experience substantial investments in the coming years with the entry of private sector in basic telecom, mobile satellite communication systems, digital broadcasting and several other value added services. The Government has approved telecom services as an infrastructure facility thus extending concessional customs duties and other fiscal incentives that can be availed by the telecom service operators. This is likely to give impetus to the telecom service sector in the country.

4.1.3.5 Strategic Electronics

The strategic electronics sector covers the equipments and systems like navigation and surveillance system, satellite based communication systems, radar, navigational aids, sonars, underwater systems, electronic warfare and signal intelligence systems etc. Technologies of this sector are quite expensive and are closely held by the developed countries.

Production in this sector increased from Rs. 3850 million during 1992-93 to Rs. 18000 million in 2001-02. During the same period national electronics

hardware production increased from Rs. 120350 million to Rs. 327500 million. The important observations with regard to this sector are as follows:

a) The production of Strategic electronics for the period 1992-93 to 2001-2002 had a CAGR of 18.7 % much higher than the CAGR of 11.8% for the national electronics hardware. During 1992-93 and 1997-98 a negative growth was observed. Cumulative growth rate declined sharply during IX Plan from 27.9% (VIII Plan) to 9.8%.
b) Strategic electronics has a steady growth with share in total electronic hardware at the rate of about 5% from 1992-93 onwards.
c) The exports achieved a CAGR of 34.3% over 1992-93 to 2001-02. **However, a low export to production ratio of 3.9% (2001-02) indicates low demand in the export market and shows higher consumption in the domestic market**.

It has been found that this sector has recorded a minimal export and there has been a mixed trend with exports worth Rs. 50 million in 1992-93, Rs. 400 million in 1993-94, Rs. 200 million during 1994-95 and 1995-96, increasing it to Rs. 300 million in 1996-97 and then onwards a decline was observed. Share of this sector in the total exports of electronics hardware from 1992-93 to 1997-98 was found to be within a range of 0.33% to 3.6%.

4.1.3.6 Electronic Components

Production in this sector has increased from Rs. 22400 million during 1992-93 to Rs. 57000 million in 2001-02. During the same period national electronics hardware production increased from Rs. 120350 million to Rs. 327500 million as indicated in Table 4.4. The important features of this industry are as follows:

a) Electronics components' production had a CAGR of 10.9% as against CAGR of 11.8%. for the total national electronics hardware.
b) The industry achieved a CAGR of 8.04% much lower than that of world level of 15.25% during 1998-2001.
c) The share of electronics components in the total electronics hardware production has declined moderately from 18.6% in 1992-93 to 18.2% in 1996-97 to 18.5% in 1999-00 to 17.4% in 2001-02.

d) The exports growth for 1992-93 to 2001-02 gave a CAGR of 30.5%, highest among all the sectors of electronics hardware. **A high export to production ratio of 38.5% is an indicator of export demand for the product.**

Indian electronic components industry is catering to the requirements of consumer electronics, telecom, defence and information technology. There are about a thousand units manufacturing different types of active and electromechanical components. The components in production in India today include TV picture tubes (B&W and Colour), monitor tubes, diodes and transistors, power devices, Ics, hybrid microcircuits, resistors, capacitors (plastic film, electrolytic, tantalum, ceramic), connectors, switches, relays, magnetic heads, DC micro motors and tape deck mechanism, PCBs, crystals, loudspeakers and hard and soft ferrites. A number of components units have got ISO 9000 certification and other approvals like UL, VDE.

A few components like colour picture tubes, monitor tubes, hard ferrites, B&W picture tubes, electrolytic capacitors, PCBs, floppy diskettes, audio and video tapes are exported from India. Exports from India in this sector has increased sharply from Rs. 2000 million in 1992-93 to Rs. 8400 million in the year 1997-98.

The growth in this sector is of vital importance in the sustaining development of electronics industry. It is the backbone of electronics hardware manufacturing Industry. The existing component base is not sufficient to meet the demand. In order to bridge the demand supply gap, considerable scope exists for setting up globally competitive plants in this sector both for internal consumptions and exports.

4.1.3.7 Computer Software

Software Export has been identified as one of the thrust areas for the growth of India economy. Software offers enormous potential for employment and exports. Over the years, performance of the Indian Software industry has been exceedingly good. Indian Software Industry has already established its

credentials in providing high quality software solutions to the world market. Indian Software strength has been in the availability of English speaking technical manpower in abundance that is well suited for the analytical work like software development. Government endeavor is to make India a superpower in the area of software and has set an ambitious export target of US$ 50 billion for the year 2008.

a) Computer software exports had A CAGR of 55.8%, against a CAGR of 22.3% for the total electronics hardware and software combined. This sector improved a lot during IX Plan over the VIII Plan increasing CAGR from 53.1% in VIII Plan to 53.9% during IX Plan.
b) The share of software in the total electronics and software combined has significantly increased from just 8.9% in 1992-93 to 59.5% in 2001-02.
c) **The exports to production ratio of 75.8% in 2001-02 and its exponential growth in the past is an indicator of India finding a niche in this sector and a wide scope in the future**.

Figure 4.5 shows that contribution of software exports in total software development in India has grown with much faster rate than the domestic software since the terminal year of VIII plan i.e. 1996-97. This also reflects that launching of special software exports scheme i.e. STP scheme by India has positive contribution to the tremendous growth in this sector.

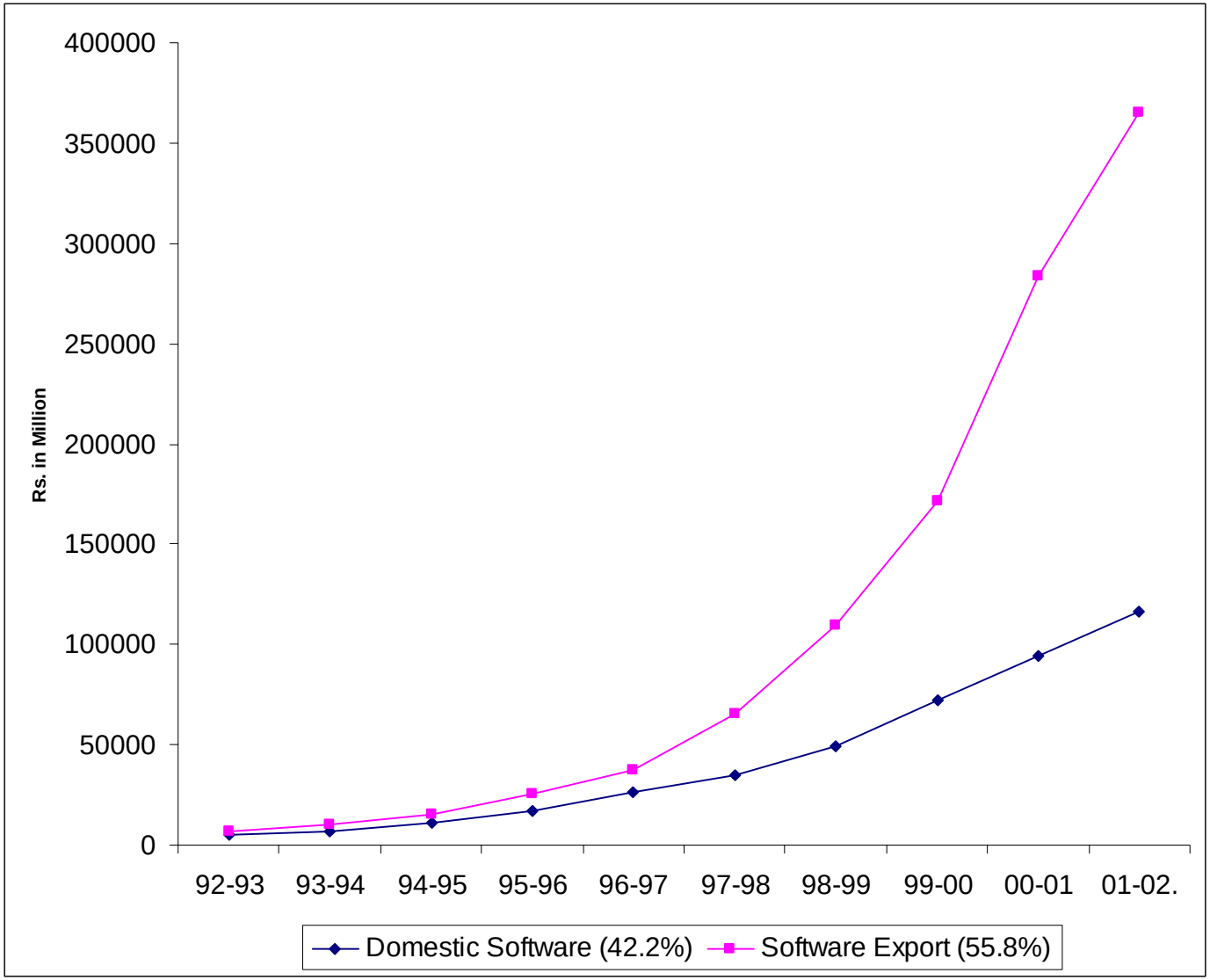


Figure 4.5 Growth Trend in Software (Exports vis-a-vis Domestic)

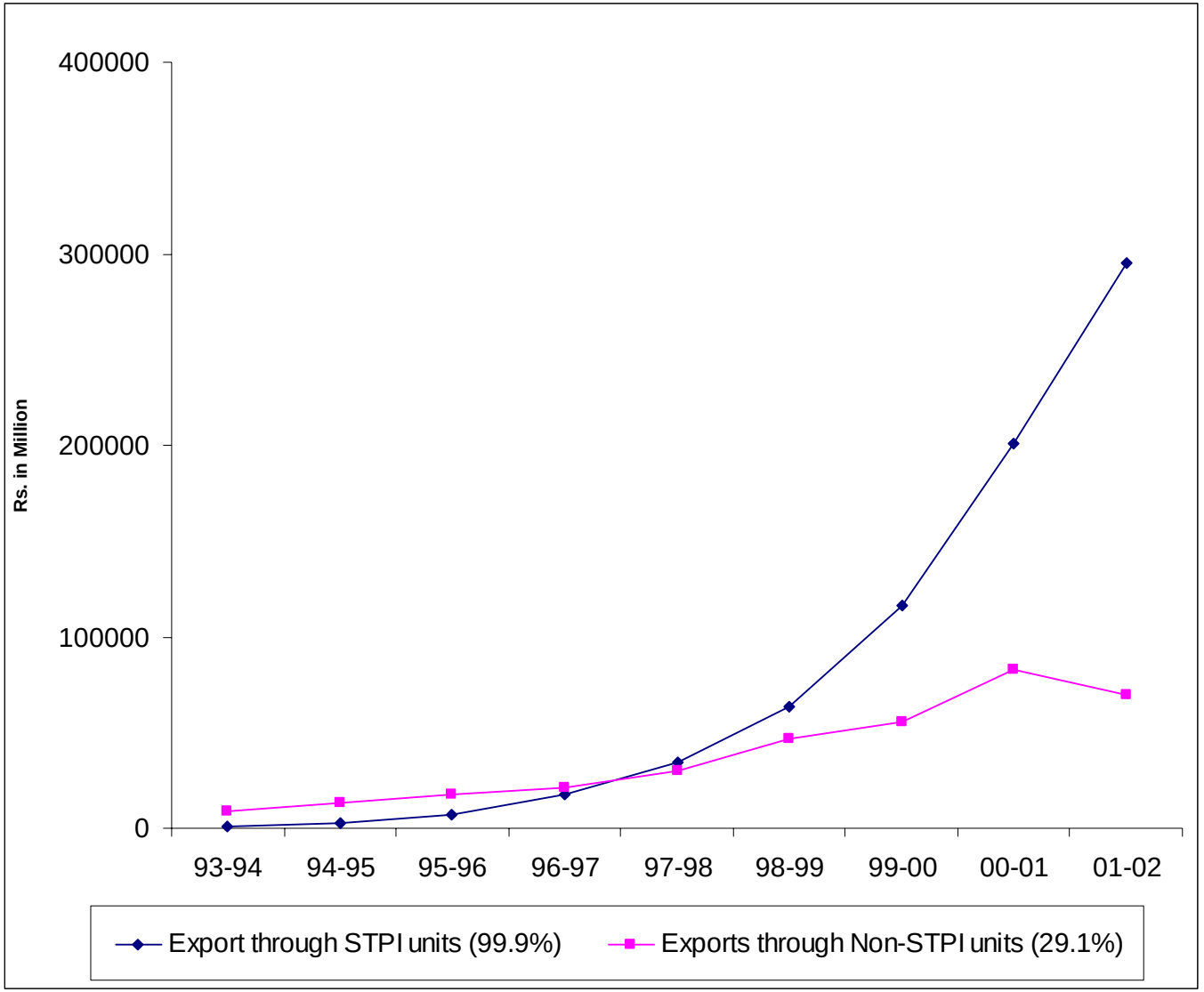


Figure 4.6 STPI's Contribution in Software Exports from India

It was observed that there was a high increase in share of exports made by STPI units out of total country exports of software. An increase was from 11.37% in 1993-94 to 80.88% in 2001-02. This signify a positive inclination towards registration of software exporters with STPI and tremendous performance by STPI centers across the country (Table 4.7). Figure 4.6 indicated a sharp increase in growth in software exports by STP units. This is because of the fact that units registered under STP scheme enjoy single window regulatory services along with several incentives like 100% income tax exemption and duty free imports.

Table 4.7 STPI's Contribution in Software Exports from India.

(value in Rs. million)

SN	Sector	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	CAGR (%)
1	**Export through STPI units**	1160	2450	7237	17800	34244	63000	116070	200510	295230	99.85
	STPI's Share(%) of total Exports	11.37	15.96	28.72	45.64	53.51	57.59	67.68	70.73	80.88	-
2	Exports through Non-STPI units	9040	12900	17900	21200	30000	46400	55430	82990	69770	29.10
	Total Exports	10200	15350	25200	39000	64000	109400	171500	283500	365000	56.39

Source : Software Technology Parks of India, DIT, Government of India, Electronics Niketan, New Delhi.

The Government constituted a National Task Force on Information Technology and Software Development. The Government has accepted the Task Force recommendations and has gone ahead in implementing these recommendations by announcing major fiscal benefits to the IT sector. Recognizing the importance of venture capital funding for growth of the software industry, Government of India has approved setting up of an IT Venture Capital Fund with a corpus of Rs.1000 million in association with Small Industries Development Bank of India (SIDBI), Industrial Development Bank of India (IDBI) and the Software Industry. STPI scheme has further being supported by DIT for boosting software exports from India.

Quality Achievements

As per Elsoftex (February'2003), 46 out of 69 SEI CMM Level 5 certified companies worldwide are located in India followed by 19 in USA, 2 in China and one each in Canada and Russia. The SEI-CMM frame work has been devised by the software Engineering Institute (SEI), and represents a path of improvement recommended for software organizations to enhance their software process capability.

The benefits of the SIE-CMM include better control of products and processes, lower effort and schedule overruns and better project risk management leading to lower costs and high customer satisfaction.

4.2 TARGETS FOR ELECTRONICS INDUSTRY FOR THE YEAR 2008

The National IT Task Force set up with the cabinet approval in 1998 to formulate the draft of a National Informatics Policy made over 108 recommendations. Targets by the Task Force for the year 2008 have been specified in Table 4.8 and Table 4.9.

Table 4.8 Targets by the National IT Task Force for Hardware and Software Production for the Year 2008

(Value in Rs. Million)

S N	Sector	Production	Exports		
1	Hardware Industry	**460000**			
2	Software Industry	**4002000**	**2300000**	**45%**	**36%**
	• IT Services	1771000	1058000		
	• Software Products	897000	368000		
	• IT Enabled Services	874000	690000		
	• E-Business	460000	184000		
	TOTAL	**4462000**	**2300000**		

Source : National IT Task Force Recommendations.

For the software industry the production of Rs. 4002000 million and exports of 2300000 million with a base year as 2001-02 are achievable with growth rate of 45% and 36% respectively. The corresponding growth rates for the last ten years (1992-93 to 2001-02) are 51.2% and 55.8%. Thus it present performance is maintained the actual production and exports will exceed the target set by National Task Force.

Table 4.9 Targets by the National IT Task Force for Employment Generation for the Year 2008

S N	Sector	Employment
1	**Hardware Sector**	
	• Direct	1.6 million
	• Indirect	3.2 million
2	**Software Sector**	2.2 million
	TOTAL	7.0 million

Source : National IT Task Force Recommendations.

4.3 CONCLUSIONS

1) The analysis revealed that the actual production and growth of electronics has been much below the targets during the VIII and IX five year plans. The percentage of fulfillment of targets shows a consistent downward trend as the plan years go by. This is reflected clearly for both the plans. This trend may be attributed to I) obvious forecasting limitation of difficulty in forecasting the distant future and ii) the time lag in change in policies and actual situation due to unpredictable events and changes in the national and international scene.

2) On the basis of sectoral production, exports and percent share of exports to production the following inferences can be drawn with respect to performance and demand.

Consumer Electronics

The value of production for consumer electronics has been maximum of all the sectors during all years of the period 1992-93 to 2000-2001. It had a

CAGR of 15.9% the highest among all the sectors of electronics industry and also higher than that of world growth rate. The percentage share of exports to total production of consumer electronics has been more or less constant at 5.5% of the production. Incidentally the growth of exports CAGR was 15.9% but was lowest among all the segments. A rising production volume and a relatively low constant percentage of exports is an *indicator of high domestic demand as compared to export potential.*

Industrial Electronics

During the period 1992-93 to 2000-2001 industry achieved a production CAGR of 11.3% and export CAGR of 27.7%. The growth of this industry in India was also higher than the growth at the world level during the same period. The export to production ratio of 21% in 2000-2001 is *an indicator of high export potential.*

Computer Hardware

This industry for the period 1992-93 to 2000-2001 had a CAGR of 9.8% and an export CAGR of 24% with a export to production ratio in 2001-2002 as 50.7%. The growth of this industry was however less than that of the world level for the same period. The *performance is an indicator of a high domestic and export potential for computer hardware.*

Electronics Communication

During the period 1992-1993 to 2001-2002 this industry had the lowest production CAGR of 5.4%, and CAGR of 22.6%. However, the percentage of exports to production during 2001-2002 was found to be only 3.3% less than 5.2%, the average for the period of 10 years. The industry witnessed a negative growth rate of –1.83% as against world's 8.83% during 1998-2001. There have been wide fluctuations in exports during this period. The *overall performance is an indicator of intense competition & low potential in the export market.*

Strategic Electronics

During 1992-93 to 2001-2002 period Strategic electronics achieved a production CAGR of 18.7% and in exports CAGR of 34.3%.However it had a very low export to production ratio of 3.9% for the year 2001-2002, the *performance indicates a low demand in the export market.* (The export growth rate is deceptive as it involves low volumes).

Electronics Components

This production of Electronic Components during 1992-93 to 2001-2002 achieved a CAGR of 10.9% and export CAGR of 30.5%. The industry in India had a CAGR of 8.04% much lower that that at the world level CAGR of 15.25% during 1998-2002. The export to production ratio for 2001-2002 was 38.5%. The *performance is an indicator of high domestic and export potential for the industry.*

Computer Software

The production of Computer Software during 1992-93 to 2001-2002 achieved an impressive CAGR of 51.2% and export CAGR of 55.8%. The export to production ratio for 2001-2002 was 75.8%. The *performance is an indicator of high potential of software in both the domestic & export market.*

3) The performance of STPI units achieved a growth of 99.9% during t he period 1993-94 to 2001-2002. This also is an indicator of success of STPI Scheme of Government of India.
4) The outstanding performance in exports by some of the sectors in electronics & software (IT) industry can be attributed to liberal industrial & EXIM policies of Govt. of India announced especially in 1990-91 & 1999-00
5) In the area of Quality, 46 out of 69 SEI CMM Level 5 certified companies worldwide are located in India. The benefits of the SIE-CMM include better control of products and processes, lower effort and schedule overruns and better project risk management leading to lower costs and high customer satisfaction
6) The targets set by National IT Task Force especially for software production and exports for the year 2008 are likely to be exceeded if the CGAR achieved over the last 10 years is maintained during the remaining period.

CHAPTER - 5

EVALUATION OF ELECTRONICS AND IT POLICIES AND INSTITUTIONAL SUPPORT AT NATIONAL AND STATE LEVEL

This chapter describes in detail the initiatives at national as well as state level in the electronics and IT sector. The Industrial, Investment and Fiscal Policies and schemes for electronics hardware and software like EHTP and STP notified by the Government of India have been analyzed and salient features of each have been presented in this chapter. Import and export of capital goods have been discussed under EXIM Policy.

The electronics and IT policies along with prevailing incentive package offered by the states under study have been critically examined and explained in detail. Initiatives at state level by government as well as Industry efforts in regards to establishment of specific infrastructural facilities for the electronics and IT sector based on the parameters namely sector specific R&D and technological upgradation, adequacy of bandwidth for data communication to software exporters, adequacy of sector specific industrial complexes and working office space, availability of specific technical skill base, financial and marketing support and availability of quality electric power and general industry specific requirements have been critically examined and presented in this chapter. Further, the investigation of the primary data acquisitioned from electronics and software industries of the four states under study through questionnaires and schedules and the expert views of experts of the field have been supplemented to arrive at specific findings. Based on the findings, certain observations have been concluded in the form of recommendations for better growth of this sector of industry in the states of Punjab and Haryana.

5.1. National Level Electronics and IT Policies

Restructuring its economies was the objective of Industrial Liberalisation Policy of India announced in the year 1991. There have been a substantial reforms during this period in respect of Industrial, Trade and Fiscal policies.

Transparency of procedures and integration with the international market has been the major thrust of the new policies. The policies and procedures notified by the government of India as applicable to electronics and IT industry have been studied and salient features of these as observed are described in the foregoing sections.

5.1.1. Industrial Approval Policy

a) Licensing has been virtually abolished except for manufacturing electronic aerospace and defense equipment.
b) There is no reservation for public sector enterprises in the electronics industry and private sector investment is welcome in every area.
c) Electronics Industry can be set up anywhere in the country, subject to clearance from the authorities responsible for control of environmental pollution and local zoning and land use regulations.
d) Industries exempted from licensing are required to file only a memorandum with the Secretariat for Industrial Assistance (SIA), Ministry of Industry, Government of India.

5.1.2. Foreign Investment Policy

a) Policies for Foreign Direct Investment (FDI) provide for automatic permission from the Reserve Bank of India (RBI) for foreign equity up to 51 per cent in software and almost all areas of electronics, and also up to 74 percent for manufacture of industrial process control equipment, etc. provided the import of capital goods is as per the EXIM Policy.
b) If the import of capital goods is as per the EXIM Policy, the proposals from Non-Resident Indians and overseas corporate bodies whose predominant owners are NRIs are allowed automatic approval for equity up to 100%.
c) Except aerospace and defence, automatic permission for foreign technology agreement in all other areas of electronics is allowed by RBI, provided:
    i) Lumpsum payment of the price of the technology is limited to US$ 2 million.

ii) Royalty payments do not exceed 5 % for domestic sales and 8 % for exports (The royalty rates are net of taxes).

d) A special 'Foreign Investment Promotion Board' (FIPB) has been set up by the Government of India as a fast track mechanism to invite and facilitate foreign investments in large projects in India which are not covered by the automatic approval process and norms under which secretariat for Industrial Assistance (SIA) in the Ministry of Industry is authorized to grant investment approvals. The FIPB has the mandate to allow larger foreign ownership and royalty payments and to consider proposals for foreign investment in all types of activities.

5.1.3. Fiscal Policy

a) All exporters and foreign exchange earners are allowed to convert their foreign exchange earning at the market exchange rate. The Indian rupee was observed to be fully convertible on the current account.
b) Tax exemption for Exports profits.
c) Depreciation on IT/Products is at the rate of 60 per cent.
d) Income derived by foreign companies as dividend and interest is taxed @ 20% and payments in the form of royalty and technical service fees is taxed @ 30%.
e) Definition of Computer Software, as in Section 80 HHE of the IT Act, widened to include transmission of data.
f) Benefits of Section 80 HHE extended to supporting developers.
g) Exemption of withholding tax on interest on External Commercial Borrowings (ECB) extended to the IT Sector.
h) No gift tax on computers.

5.1.4. EXPORT- IMPORT (EXIM) Policy

The import of raw materials, components, consumables spares, capital goods and other items required by industrial units is governed by EXIM policy which is a 5 year policy for assuring continuity to the users. The present policy

is applicable up to 31st March'2002. The policy covers schemes aimed at promoting exports some of important ones are explained below.

5.1.4.1. Import of Capital Goods/Second Hand Machinery

Under the policy, all capital goods are freely importable. Import of second hand machinery having minimum residual life of 5 years was noticed to be permitted, subject to actual user condition.

5.1.4.2. Export Promotion Capital Goods (EPCG) Scheme.

a) It was observed that under this scheme electronics and software units are allowed to import capital goods at 5% import duty on the basis of self declaration regarding the nexus between capital goods imported with items to be exported.
b) The export obligation was observed to be 5 times the CIF value of CG on FOB basis or 4 times the CIF value of CG on NFE basis to be fulfilled over a period of 8 years.

5.1.4.3. Duty Exemption Scheme

a) It was found that under this scheme imports of inputs are permitted duty free for export production. Annual advance Licenses can be obtained on self-declaration basis.
b) Certain specified categories of supply of goods by the main / sub-contractors are regarded as 'Deemed exports' under EXIM policy, provided the goods are manufactured in India.

Special Economic Zones (SEZ)

a) SEZ is a specifically delineated duty free enclave and is deemed to be foreign territory for the purposes of trade operations and duties and tariffs.

b) Goods going into the SEZ area from DTA area treated as deemed exports and goods coming from the SEZ area into DTA are treated as if the goods are being imported.

5.1.4.4 Duty / Tariff Structure

a) The customs duty has been reduced to 4 slabs of advalorem rates of 5%,15%,25% and 35%.

b) The central Excise duty has been rationalized to a single slab rate of 16%.

Table 5.1 Customs Duty on Raw Materials /Inputs for IT /Electronic Components in Various Countries

Country	Custom Tariff Range (%)	Country	Custom Tariff Range (%)
USA	0-2	China	0-5
Japan	0-2	Brazil	0
South Korea	0-2	Thailand	0-5
EU	0-2	Mexico	0-2
Malaysia	0-5	Philippines	0
Singapore	0	**India**	**0-35**
Taiwan	0		

Source : IPAG Journal : Electronics Information & Planning, Vol.29, No.5, February'2002

Table 5.2 Customs Duty on Capital goods for IT /Electronic Components in Various Countries

Country	Custom Tariff Range (%)	Country	Custom Tariff Range (%)
USA	0	China	0
Japan	0	Brazil	0
South Korea	0-2	Thailand	0-5
EU	0	Mexico	0
Malaysia	0	Philippines	0
Singapore	0	**India**	**25**
Taiwan	0		

Source : IPAG Journal : Electronics Information & Planning, Vol.29, No.5, February'2002

A comparative summary of customs duty on raw materials /components /inputs for electronics and IT industry in various countries is presented through Table 5.1 and Table 5.2.

5.1.5. Special schemes for Electronics Hardware & Software

Special schemes are available for setting up export oriented units for the electronics sector. Foreign investment of upto 100% is permitted in units setup solely for exports. Various incentives and concessions are available for export oriented units. These schemes are :

5.1.5.1. Electronics Hardware Technology Parks (EHTP) Scheme

A scheme for setting up 100% export oriented unit in the area of electronics hardware. Salient features of the scheme as observed are discussed below.

a) The existing units in Domestic Tariff Area (DTA) can be converted into EHTP units. The existing EOU units may also opt for conversion to EHTP unit.
b) Foreign equity upto 100% is permissible.
c) Duty free imports of capital goods, raw materials, components and other inputs.
d) Net Foreign Exchange Earnings as a Percentage of Exports (NFEP) of an EHTP unit is required to be Positive and the minimum export performance (EP) prescribed for five years is UDS 1 Million or 5 times the CIF value of imported Capital Goods, whichever is higher.
e) Net Foreign Exchange Earnings as a Percentage of Exports (NEEP) is the net foreign exchange earned by the unit expressed as a percentage of FOB value of exports and shall be calculated for a period of 5 years, according to the following formula:

$$\text{a. NFEP} = \frac{A - B}{A} \times 100$$

f) Where A is the FOB value of exports and B is the sum total of the CIF value of all imports and all payments made in foreign exchange.

g) Access to the Indian domestic market is allowed upto 50% of the FOB Value of Exports, subject to Positive NFEP.
h) An EHTP unit can be set up for both software and hardware operations in an integrated manner, subject to the conditions that the minimum NFEP for the software component will be 20% and the DTA sale of software shall be restricted to 50% of FOB value of exports.
i) Sales to the domestic market from the EHTP units are subject to only 50% of the duties of customs leviable on like on like goods imported.
j) EHTP units are exempted from corporate income tax for period of 10 Years.
k) Supplies made from Domestic Tariff Area (DTA) to EHTP units are eligible for the benefit of deemed exports.

It has been observed that through EXIM policy - 2002-2007, the EHTP scheme had been modified to enable the sector to face the zero customs duty regimes under ITA-1. It was noticed that these units shall be entitled to the following facilities:

- Net foreign exchange as a percentage of exports positive in 5 years.
- No other export obligation for units in EHTP.
- Supplies of ITA / items having zero duty in the domestic market to be eligible for counting of export obligation.

5.1.5.2. Software Technology Parks (STP) Scheme

A scheme for setting up 100% export oriented unit in the area of software. Salient features of the scheme as observed are discussed below.

a) The existing units in DTA can be converted into STP units. The existing EOU units may also opt for conversion to STP unit.
b) Foreign equity upto 100% is permissible.
c) Duty free imports of capital goods, raw-materials, components and other inputs.
d) Net Foreign Exchange Earnings as a Percentage of Exports (NFEP) of an STP unit is required to be 20% and the minimum export performance (EP)

prescribed for five years is UDS 0.25 million or 5 times the CIF value of imported Capital Goods, whichever is higher.

e) Sales in the Domestic Tariff Area (DTA) is permissible upto 50% of the FOB value of exports.

f) Supplies made from DTA to STP units are eligible for the benefit of deemed exports.

5.2. NATIONAL LEVEL INSTITUTIONAL SUPPORT AND INFRASTRUCTURAL FACILITIES

The rapid and sustained technological change that has characterized electronics manufacturing over the past two decades necessitates certain sector specific infrastructure facilities in addition to the general requirements. These specific infrastructure facilities required by this sector have been presented below.

(a) Technology
- Research and Development

(b) Infrastructure Facilities
- Testing and Quality Assurance
- High Speed Data Communications.

(c) Human Resource Development

5.2.1. **TECHNOLOGY** (RESEARCH AND DEVELOPMENT)

The Department of Electronics has been giving high priority for all round development of technology in the country. The DOE supports and funds technology development through its councils set up in various fields. A major result of sponsored research has been the enhancement of technological base and capabilities in the country, besides generating specific hardware.

5.2.2 INFRASTRUCTURAL FACILITIES

5.2.2.1 Standardisation, Testing and Quality Certification Directorate

In order to build quality consciousness and to provide the testing support to the electronic industry for improving their product quality and increasing their

competitiveness in the global market, the Department of Electronics has established Standardisation, Testing and Quality Certification Directorate (STQC). Under this Directorate, a network of twenty two test laboratories (ERTLs), seventeen Electronics Test and Development Centres (ETDCs) and a Centre for Reliability (CFR) has been established to provide testing, calibration, product development assistance, education, counseling and other quality related services to electronic industry as per national /international standards.

5.2.2.2. High Speed Data Communication Facility

a) Education & Research Network (ERNET)

Education and Research Network (ERNET) has been providing network services to Indian Academic and Research Community since 1990. Today, ERNET provides connectivity to over 700 organisations which represent a cross-section of universities, academic institutions. R&D labs, some NGOs and has over 80,000 users. It has set up about 10 web servers.

b) National Information Infrastructure.

The convergence of erstwhile different technologies namely Computers, Communications, Consumer Electronics and Contents/Multimedia (4Cs) has led to launching of National Information Infrastructure (NII) in several countries worldwide. Recognising the need for setting up NII within the country to boost socio-economic development and reduce the gap between societies and people,

c) Software Technology Park of India

The wide band IBS earth stations (2x2MBPS) have been established at STPs in Bangalore. Hyderabad, Thiruvananthapuram, Gandhinagar, Noida, Bhubaneshwar, Pune, Navi Mumbai, Mohali, Chennai, Jaipur, Manipal and Mysore to provide High Speed Data Communication facility which serve as International gateways. The units operating inside the complex can utilize the facility on shared basis and the units operating from their own premises. i.e. outside the complex can have access to this facility through line-of-sight point-to-multipoint TDMA microwave links, eliminating the terrestrial links totally.

STPI has dedicated International Gateways at each of its centres and the network established through these gateways is called ‘SoftNET. It provides different level of services to its member units in order to ensure sustained growth and moving up in the value chain.

SoftNET offers following kinds of services :

- **SoftPOINT**:
  Point-to-Point International Leased High Speed Data Communication links of 64 Kbps upto 2Mbps.
- **SoftLINK** :
  A TCP/IP based shared Internet service which uses its own International Gateway for the upstream connectivity. The customer is connected on to the port on a router and has the direct Internet access.
- SoftLINK Provides access to various value added services available on Internet like :
  1. Internet E-Mail service.
  2. Transparent file transfer.
  3. Remote Log-in facility.

- **SoftCONF** :
  A two way full motion picture quality video conferencing facility between STPI units and rest of the world.

- **Internet Gateway Services** : STPI offers Internet Gateway access or dedicated leased lines to authorised ISPs through its Gateway at all the locations.

5.2.3. HUMAN RESOURCE DEVELOPMENT (Education and Training)

The focus of the Department of Information Technology is on development of globally competitive quality manpower in Computers,

Electronics, Information Technology and Telecommunications. To meet this objective, the multi-pronged strategy being followed in DIT includes :

- Upgradation of quality of education in existing institutions.
- Identification of gap areas & developing specialised programmes; and
- Introduction of new educational technologies.

5.2.3.1 DOEACC Society

DOEACC (Department of Electronics Accredited Computer Courses) Society has been established to utilise the expertise available in the non-formal sector for generation of quality manpower, in keeping with the fast changing needs of the Computer Industry, especially in the areas of software development and computer applications. Under DOEACC Scheme, private and public sector institutions are given accreditation for conducting specified levels of courses, viz. 'O' (Foundation), 'A' (Advanced Diploma), 'B' (MCA) and 'C' (M.Tech). More than 600 institutions all over the country are conducting accredited courses.

5.2.3.2 Other Initiatives

In addition to above, it was observed that the DIT supports and funds training and education through following centers owned by the government

a) Centre for Electronics Design & Tech. of India
b) National Centre for Software Technology.
c) Software Services & Support & Education Centre

5.2.4. FINANCIAL ASSISTANCE TO INDUSTRY

5.2.4.1 Venture Capital Fund

A venture capital fund with corpus of Rs. 1000 million has been created by the Department of Information Technology to provide financial assistance to IT industry.

5.3. STATE LEVEL SUPPORT

Institutional support and Infrastructural facilities available for electronics and I.T. Industry in each of the state under study have been critically evaluated and presented below under seven categories. In each category, Quantitative Analysis and Qualitative Analysis have been carried out separately. Quantitative Analysis has been presented into two parts: Results from primary sources and Results from secondary sources.

5.3.1 STATE ELECTRONICS AND IT POLICIES

5.3.1.1 Quantitative Analysis of Data

Results from Primary Sources

Eighteen of the 28 sample electronic units (64.3%) suggested that import tariff structure should be such that it encourages investment in domestic component industry. Present duty structure makes it unviable to invest in component manufacturing in India. Literature survey (Nambiar,1985) also revealed that lack of low growth in electronic industry was due to failure of component industry and suggested a zero duty structure for a strong component industry.

One out of four electronic units (25%) from Mohali suggested that to sort out power crises in the state, government scheme /subsidy be introduced in Punjab for manufacturing CFL as it has been allowed in Kerala state. Two software exporters each from Punjab and Karnataka were found to have suggested the state policy to provide industry friendly environment and flexibilities in labour laws to allow three shift working for all men and women.

However, it has been noticed that as per provisions of Factories Act, a state government can only relax to allow women to work up-to 10 PM instead of 7 PM. Punjab has also allowed self- certification in respect of all labour laws to minimize government inspections (interference) in industries.

Results from Secondary Sources

All the states have prepared their independent IT policies and have focused on inviting investments in the IT sector in their respective state through private participation and promote IT in education, IT in Government and IT in Industry and offer more or less same types of incentives to the industry. Every state today emphasizes on e-governance in their state departments and its various agencies. None of these policies give clear-cut implementation modalities and framework.

Punjab's new IT Policy (2003) notified on 25th March'2003 by the government is a comprehensive common policy for IT, ITES, Electronics and Biotechnology sectors. It was observed that power reforms have been promised by every state, setting up of IT Parks are emphasized and VAT is promised. Haryana was observed to have earmarked 5% budget in each of its government department for IT activities including training as against 1% by U.P. and 2% by Punjab.

Focus of IT and electronics policies in all the four sample states was found to be based on government acting as a facilitator for creating industry specific infrastructure and in promoting electronics and software industry in the states. Thrust areas are also common for all and included IT, ITES and Biotech industry. The states have earmark 1-2% of the departmental budgets for computerization and training of personnel. All the states have promised escort services to industry for easy government clearances. All states have promised to implement VAT.

Punjab has made an exception by allowing the same set of incentives to electronics manufacturing industry as applicable to IT sector and came out with the common policy for electronics, IT, ITES and Biotechnology sector. A Comparison of the State Policies of Karnataka, U.P, Punjab and Haryana with respect to Electronics and IT Industry has been made in Table 5.3.

Table 5.3 Comparison of the State Policies of Karnataka, U.P, Punjab and Haryana with respect to Electronics and IT Industry

SN	Description	Karnataka	U.P	Punjab	Haryana
1.	Latest policy	IT Policy-1997	❑ Electronics Policy-95 ❑ IT Policy-1999	IT, ITES, electronics and Biotech Policy-2003.	IT Policy-2000
2.	Focus of the Policy	e-governance IT for masses	➢ To create facilitative administrative system ➢ Reduce lead time in setting up of Industries ➢ Remove bureaucratic hindrances ➢ Provide internationally competitive infrastructure	➢ IT infrastructure ➢ BPO and ITES ➢ e-Governance ➢ Bio-informatics	➢ Re-engineering of administrative processes. ➢ e-Governance
3.	Thrust Areas	IT and ITES	IT	IT Bio-Technology ITES	IT and ITES
4.	Budget allocation for IT activities in Govt.	Separate budget for IT activities earmarked in each government department of the state.	To earmark 1% of the departmental budgets for computerization and training of personnel.	Separate budget for IT activities earmarked in each government department of the state.	5% in each department for IT.
5.	Promoting IT in Education	Yes	• To achieve 5% computer literacy in 10 years and 20% literacy in 20 years,	Yes	The phased plan for IT literacy tol be implemented by the year 2003 and setting up of IIIT.
6.	Promoting IT in Government	Yes	• UP as smart State in 10 years	Yes	e-governance in the state.
7.	Promoting IT for Industry	Yes	• Setting up of an independent Department of IT • An IT Vision group with rep from industry, Users and Academia • Organizing Annual IT events with industry. Promoting private investment in Infrastructure.	Yes	Promoting IT through private participation.
8.	Speedy Facilitation (Single Window Services)	Yes	• Escort services to Industry for easy govt. clearances	Yes	Yes

9.	Infrastructure development	Setting up of IT infrastructural facilities like ITParks and IT Training centers in Hubli, Mysore, Manipal, Mangalore besides Bangalore.	• Upgrade existing infrastructure • Electronics cities at Noida, Agra • Cyber City at agra • IT Parks at Noida and various other locations in the state in joint sector. • Increase Internet penetration in the state. • Telephone connectivity to all 1.12 lac villages of the state.	Government to facilitate through private participation.	Government to facilitate through private participation.
10.	Reforms of Power Sector	yes	No reference	Yes	Yes
11.	Incentive Package - Implementation of VAT - Abolition of Octroi - Simplification of procedures	Likely No Octroi Yes Industrial Power Tariff	Likely - Yes Yes	Likely w.e.f 1-4-2003. No Octroi w.e.f March'2003. Yes Yes	Notified in March'2003. No Octroi Yes Yes
12.	Other initiatives	Latest Mahithi Millennium Policy dedicated to promote IETS industry.	A separate Electronics Policy-1995	Common Policy for IT, ITES, Electronics and Biotechnology Industries.	e-governance implementation.

Source:

- "*New Industrial Policy-1996*", Department of Industries, Government of Punjab, 1996, Notification No. 15/43/96-5IB/2238 dated 20-03-1996.
- "IT Policy and Special Package of Incentives for IT Industry-2000", Department of Industries, Government of Punjab, 2000, Notification No. 15/4/99-5IB/2174 dated 15-03-2000.
- "*Industrial Policy - 1999",* Department of Industries, Government of Haryana, 1999, Notification No. 2/1/22-IBII dated 11-11-1999.
- *"I.T. Policy"*, Department of Industries, Government of Haryana, 2000.
- *"Information Technology Policy-1999"*, Department of Information Technology, Government of Uttar Pradesh, 1999, No. UPLC/ICP/7206
- *"Uttar Pradesh Industrial Policy on Electronics-'95"*, Department of Industries, Government of U.P., 1995.
- *"Information Technology Policy of Karnataka–1997*", Department of Information Technology, Government of Karnataka, 1997, GO No. CI/162/SPQ/97 dated 12-6-1997.
- "*Karnataka Industrial Policy & Incentive Package-1996*", Department of Industries and Commerce, Government of Karnataka, 1996, GO No. CI/30/SPC/96 dated 15-3-1996.

5.3.1.2 Qualitative Analysis of Data

Results from Opinion of Experts

Two of the experts pointed out that incentives play a marginal role if an entrepreneur could start his industry six month earlier than the present system. He will earn more than the incentives in financial terms. Therefore, the experts suggested that effective implementation of the policy is more important. It has been noticed that in Punjab, various complaints from industry are pending with the authorities where the industry has been refused for exemption from octroi

(sort of entry tax) by the local government officials at entry barriers even when the same has been allowed under the state IT Policy. This clearly indicate that the policy has not been effectively implemented on ground.

One of the experts suggested to setup VLSI production base in the state. Survey conducted by Arun Kumar (1995) had found that there was further scope of manufacture of LSI/VLSI in Mohali. It has been noticed that presently, there is only one company i.e. Semiconductor Complex Ltd., a government of India undertaking which is engaged in VLSI design in Punjab at Mohali. A few private sector companies have shown interest in setting up of such units in Haryana at Gurgaon. Punjab with successful experience in establishing telecommunication manufacturing companies like Bharti Telecom, Puncom, Punwire and Fujitsu Telecom in the state have positive scope for attracting private sector in setting up VLSI design facilities in the state.

During the present study, the researcher held informal discussions with experts and industrialists from different fields to know their views regarding regional approach of development of Electronics and IT industry for the Mohali-Chandigarh-Panchkula-Baddi region. Almost all of them supported the idea that the four states of Punjab (Mohali), Chandigarh, Haryana (Panchkula) and Himachal Pradesh (Baddi) should make joint efforts for the development of Electronics and IT industry in the region instead of individual efforts. A pioneering work by CRRID (2002) had also supported that instead of a state wise, isolated approach to industrial development, a collaborative, interdependent approach for the region as a whole should be put into place. To achieve this, the states of Punjab, Chandigarh, Haryana and Himachal Pradesh may jointly workout a region based 'IT and Electronics Policy' for development of this segment of Industry in Mohali(Punjab), Chandigarh, Panchkula (Haryana) and Baddi (Himachal Pradesh) region.

5.3.2 INSTITUTIONAL SUPPORT (Facilitation Role by Government)

5.3.2.1 Quantitative Analysis of Data

Results from Primary Sources

Eleven out of 21 selected electronics and IT units for the present study in Karnataka (55%), eleven out of 17 in U.P. (69%), eight out of 10 units in Punjab (80%) and six out of 11 units in Haryana (55%) indicated that SEDC should interact with industry more frequently and the agencies need to make aware the industry about the kind of support they can give to them. One unit of Punjab suggested that the leadership in SEDC should continue in office atleast for three years to proper plan schemes and implement them effectively. One software unit from Mohali (17%) and 3 electronic units from Noida (33%) stressed on government to take effective steps to remove red-tapism and corruption at all levels and simplify procedures. Nine of the electronic units and one software export unit suggested switching from beaurocratic to professional working in government agencies. The fact has also been supported by earlier studies and surveys. (Sukhmani,2000;Nonika,1999) have found that non-professional approach in the government agencies have been one of the main reason for low growth of electronics industry in Mohali.

Sixteen out of total 30 IT units (53%) were found to be facing abnormal delays in customs clearances and six of them (21%) were of the opinion that customs related problems of software exporters should be handled by STPI under its single window concept.

Two electronic units from Haryana, one from Punjab and one software unit from U.P suggested to make an advisory team of professionals of high caliber and good profile from private electronics and IT industries and academic /research institutions for advising Govt. on improvements in the electronics and IT sector in the states. It has been seen that IT Vision groups and High power empowered committees are constituted by both the states but after one or two meetings are held, no follow-up action has been taken for effectiveness of these advisory groups and committees.

Results of secondary data have revealed that all the four states under study have formed advisory groups, however, advisory group of only one state i.e. Karnataka which is the best performer is active.

Eight electronic and six of software units (24%) from the sample suggested to encourage best performers, by constituting an award “Best Software/Electronics Unit of the Year” to be awarded annually to best of two electronic units. This will motivate industry and improve their working.

Results from Secondary Sources

Each of the four states have set up an independent Department of Electronics and Information Technology around the same time i.e. 1996-97 to put concentrated efforts to frame attractive industrial policies to promote electronics and IT industry in the respective state, a job which was earlier being carried out by the state’s Department of Industries. The State Electronics Development Corporations came into existence around 1981-83 were given the task to implement these policies. Today, SEDCs work under the administrative control of the State’s Department of Electronics /IT in Karnataka, U.P. and Haryana. However, Punjab’s SEDC continue functioning under the direct control of the state’s Industries department. SEDC in Karnataka has developed a strong consultancy division to assist this sector.

During and after setting up of specialized industry like electronics and IT, providing of certain specialized facilitation services like Technological Up-gradation, Entrepreneurship Development in electronics and Consultancy services for success of this sector were considered vital by the state of Karnataka and therefore set up these facilities as separate independent entity. UPDESCO was set up by U.P. government to provide consultancy services to this sector. The two states of Punjab and Haryana are yet to think on this line. Table 5.4 gives a comparison of Institutional Support being provided to the Industry in the four states under study.

Table 5.4 Comparative Institutional Support Provided to Electronics and IT Industry in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka	U.P	Punjab	Haryana
1	State's Department of Electronics / I.T.	1996	1996	1997	2000
2	State Electronics Development Corporation (SEDC)	1980 (330 acres) - Catalyst in attracting private investments. - Development of Infrastructure: Electronics complexes, IT Parks and facilitating GoI sponsored schemes. - Training (73 centres at District level) in IT and Servicing of consumer electronic products. Consultancy Services.	1981 - Catalyst in attracting private investments jointly with HSIDC.	1980 (365 acres) - Catalyst in attracting pvt. investments. - Development of Infrastructure: Electronics complexes, IT Parks and facilitating GoI sponsored schemes. - Training • 30 IT Franchise centers in the state • Electronics Repairs and Assembly thru 5 centres under a subsidiary company	1982-83 - Catalyst in attracting private investments jointly with HSIDC. - Development of Infrastructure: Electronics complexes, IT Parks and facilitating GoI sponsored schemes jointly with HDIDC. - Training • IT Franchise centers in the state
3	STPI	1990	1990	1998	1997
4	Technological Up-gradation Corporation	Yes	NO	NO	NO
5	Entrepreneurship Development Corporation	Yes 1992	No	NO	NO
6	State Consultancy Agency	Yes	UP Indl. Consultants Ltd. (UPICO) + UPDESCO	No	No
7	State IT Task Force / IT Vision Group	Yes Active	Yes Not Active	- IT Vision Group formed in 1998-99. - Presently Inactive.	Yes Not active

Source:

- "*Indian Software Development Centres – A compendium on Government Policy, Procedure and Guidelines*", Software Technology Parks of India and NASSCOM, 1996.
- *"Annual Report*", P.S.E.D.P.C.L., 1999-2000.
- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.
- "*Annual Report*", HARTRON, 1999-2000.
- "*Annual Report*", KEONICS, 1996-97.
- "*Annual Report*", Uptron, 1996-97.
- "*Making IT Happen - A Karnataka Government Initiative*", Directorate of Industries and Commerce, Government of Karnataka, 1997.

STPI centers with dedicated earth stations to provide regulatory services and data communication facilities to the software exporters were set up in Karnataka and U.P during 1990-91. This facility came to Punjab and Haryana during 1996-97 at a time when these states had already established themselves as IT destination options.

5.3.2.2 Qualitative Analysis of Data

Results from Opinion of Experts

Two of the experts concluded following as the major weaknesses hindering development of electronics and software industry in India: small fragmented production units, high cost of capital, lack of capital intensive high tech R&D facilities, bureaucratic delays in decision making and inverted duty structure (promotes gray market). Non-availability of components, semi-conductors and other chips in domestic market as these are largely being imported was also considered as an obstacle in the development of electronics industry. Two of the experts were of the opinion that Red-tape and corruption could be overcome by effective implementation of e-governance in the state. Most of the literature reviewed supports the above opinion of the experts.

In regard to working in SEDC experts suggested that frequent changes in state government/Managing Director, SEDC (Punjab) has affected the industry as they do not know whom to communicate with. Experts have further pointed out lack of technical manpower at all levels in SEDC aggravate the situation and therefore, suggested continuity and technical orientation of SEDC. It was observed that in Punjab, from inception to the year 1992, the SEDC (Punjab) i.e. PSEDPCL was headed by a single technocrat. Then onwards, the PSEDPCL have witnessed 13-14 changes at that level. However, the case was not found to be that serious in SEDC of Haryana state. One unit of Punjab suggested that the leadership in SEDC should continue in office atleast for three years to proper plan schemes and implement them effectively.

Three of the experts from software industry suggested that Government monopoly in telecom and data-communication sector should be removed and pointed out that unstable political scenario in the state is one of the major

weaknesses hindering developments in software industry. (Bajpai, Nirupam and Shastri, 1998) also supported the idea of discontinuing the monopoly status of VSNL. (IE&MR,1996-97;TCS,1998) had also concluded that political instability in the state was one of the major cause for decline of growth rate of electronics industry in Punjab. Thirty four out of total sample of 59 units (58%) have expressed that political uncertainty is one of the major hindrance in development of electronics and IT Industry.

As a short term strategy of the state three of the experts suggested to save existing units and to promote services sector where manpower availability finds an advantage. And, as a long term strategy, the state should consolidate to make larger viable units and enter international market with a large competitive base of technical manpower in services sector.

5.3.3 INDUSTRY SPECIFIC INFRASTRUCTURAL FACILITIES

5.3.3.1 Quantitative Analysis of Data

Results from Primary Sources

Thirty-one out of 59 sample units (53%) were observed to be facing problems related to power cuts and poor quality of power supply. One unit each from Punjab and Haryana were found to be facing much delays and problems in land allotment. Eight out of 9 software exporters from Mohali (89%) and one from Gurgaon (7%) emphasizes for setting up IT Parks with residential apartments, school, and recreation facilities. IE&MR (1996-97) examined the relative attractiveness of states and supported the above finding that a good quality infrastructure is an important factor while deciding a new location by the industry. As per results from secondary sources, except Punjab the other three states have IT Park or atleast some good quality incubation facility for software export units. EHTP (Electronic Hardware Technology Parks) scheme for electronics hardware exporters have been successful at Bangalore, U.P. and Haryana. Punjab could not establish even a single successful EHTP unit in Mohali. A recent study (CRRID, 2002) also revealed that EHTP units should be set up with private initiative in Punjab.

Results from Secondary Sources

Table 5.5 gives comparison of initiatives taken by the four states in regards to infrastructural facilities creation. Electronics City/ Complex/Township in each state under study have been set up by the respective SEDC to provide land and built up sheds to units. Incubation facilities and IT Parks to provide Plug-and-Play facilities to IT export units were found to have been established by all the states under study except Punjab. Electronics Hardware Technology Parks were also observed to have been established by all the states except Punjab. Electric power is the vital input to the success of this sector. Frequent power cuts and poor quality of power supply was the common difficulty of the sector. This has substantial adding to their cost due to expenses on maintaining generators. Haryana was found to have taken effective steps in regards to power reforms. Power tariff was observed to be the lowest in Punjab among the four states.

Table 5.5 Comparative Infrastructural Facilities Provided to Electronics and IT Industry in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka	U.P	Punjab	Haryana
1	Electronics Complex	Bangalore + Mysore, Tumkur, Moskote	Noida + Ghaziabad, Manakapur	Mohali + Ludhiana	Gurgaon + Faridabad
2	IT Parks	Yes Bangalore Hubli -(2.7 L sq.ft.), 2002 Mysore Cyber Park, B'lre. 2K (Technology Incubation Centre)	NO Incubation Facility in STPI complex	NO	NO - Incubation Facility in STPI complex - Information Technology and Telecommunication Complex (provision of plots only)
3	EHTP	27 Units (May'2002)	NEPZ in Noida	No Specific EHTP available	Available Moderately successful
4	STPI center (Regulatory Services)	1991 ■ 1038 units (May'2002)	1991	1998	1997
5	Earth Station by STPI	1992	1992 at Noida Planned also in Dehradun,	1998	No Linked through STPI-NOIDA

			Lucknow, Allahabad, Varanasi and Agra.		earth station.
6	Electric Power • Power Reform • Per capita installed capacity (watts) • Per capita consumption of electricity (kwh) • Power Tariff	No Reform 70 301 Rs. 5.55 per kwh As per Dataquest report, DQ, September'2002, there are frequent power cuts at industrial installations an average 4 hours a day and 2 hours a day in residential areas.	No Reform -	No Reform 172 690 Rs. 3.70 per kwh	Reform Initiated 108 453 Rs.4.84 per kwh
7	Airports	3 (21 International Flights)	6 (All International Flights from Delhi as Delhi from Noida is only about 35 Kms. Away)	3 (International Airport in Amritsar)	1 (All International Flights from Delhi as Delhi from Noida is only about 10 Kms. Away)
8	Transportation	Poor	Good DTC bus services are extended to NOIDA.	Poor	Good
9	Social Infrastructure - Big Hotels - Clubs /Pubs - Lake /Parks - Golf Course /Sports - Week end drives	 Yes Yes Yes Yes Yes	Adjoining Delhi yes Yes Yes Yes NO	 No Yes Yes Yes Yes	Adjoining Delhi Yes Yes Yes Yes NO

Source:

- "*Status Report of Electronics City at Bangalore*", KEONICS, 07December'1994.
- "*Indian Software Development Centres – A compendium on Government Policy, Procedure and Guidelines*", Software Technology Parks of India and NASSCOM, 1996.
- "*Annual Reports*", Department of Electronics, Government of India, 1996-97, 1997-98, 1998-99,1999-2000 and 2000-01.
- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.

Public Transport facility from residential locations to the industrial centers was observed to be poor in all the four sample locations except Noida which enjoy the facilities provided by Delhi Transport Corporation between

Delhi and Noida. Social infrastructure like big hotels, clubs/pubs, golf course, lake etc. was found to be adequate in all the four locations except that big hotels are not available in Mohali /Chandigarh. Non availability of an International Airport in and around Mohali was found to be the major hindrance in development of software exports Industry in the state of Punjab.

5.3.3.2 Qualitative Analysis of Data

Results from Opinion of Experts

Four of seven experts (57%) considered good quality infrastructure as the pre-requisite for development of electronics and IT industry. Past study by **IE&MR** (1996-97) examined the relative attractiveness of states and supported the opinion of the experts that a good quality infrastructure is the most important factor while deciding a new location by the industry.

Experts also expressed their concern about software exporters who will enjoy tax benefits under STP scheme only up-to 31-3-2010 as per government of India policy. Experts are of the view that to retain existing software export Industry and further growth in Electronics and IT Industry particularly in Punjab, the state should establish Special Economic Zones (SEZ) (see para 5.1.4.3) specifically for Electronics and IT Industry in Mohali. This scheme will provide tax benefits to exporters for 20 years period. Retaining existing software export Industry in Gurgaon is not a problem for Haryana because of its strategic location.

Keeping in mind requirements of high standard infrastructure needs of IT Industry, it was suggested that concentrated efforts should be made for which independent Development Authorities for Moahli and Gurgaon need to be established. During informal discussions with industrialists in Bangalore, the researcher found that road infrastructure in the silicon valley of India is in bad shape due to which often there are traffic jams. It was noticed that even there was no space available to widen these roads hence, no scope for improvement. Therefore, while improving /developing infrastructure in Mohali and Gurgaon, Development Authorities should keep in mind requirements 20 years ahead.

5.3.4 TECHNOLOGY (R&D Facilities for Electronics and IT Industry)

5.3.4.1 Quantitative Analysis of Data

Results from Primary Sources

Twelve out of total 29 electronic (41%) and six out of 30 IT units (20%) were of the opinion that perception about Indian products in international market was that the products are of inferior quality and four out of 30 IT units (13%) considered Indian software units with lack of commitments. Twenty two out of 29 electronic units (76%) claimed to have in-house R&D facilities. Twelve each out of 29 electronic (41%) and 30 IT units (40%) were of the opinion that Quality certification by an international agency should be made mandatory for electronics and software companies. CRRID (2002) had suggested that Punjab government should facilitate setting up of R&D centres jointly with Industry.

Past studies had also stressed on R&D, interaction between universities, research centers and Industry (Agrawal, 1985;DoE, 1987;EFY, 1996). It has been observed that during 1997-98, India had allocated only US$ 15 millions for 20 R&D projects in DoE in contrast with allocation of US$ 500 for a single R&D project at a single company i.e. Intel (EFY, 1996). However, the situation in software industry is different. One of the recent studies pointed out that 158 Indian software companies had acquired International Quality Certification and as an Indian pride, 11 out of 17 companies (65%) in the world who have acquired SEI levels maturity were located in India (Dewang Mehta, 2000).

Nine of the total 29 electronic units (31%) have suggested that Government should create and maintain a database on the sources of technology available for transfer to the electronic units from within and outside India. Fifteen electronic units (52%) recommended special technology incentive for creating in-house R&D facilities which may be exempting expenses on R&D efforts from Income tax. EFY (1996) had also suggested a need to establish an Institution to keep the inventory of updated status of discoveries & inventions and also keep track of on-going research with universities, MNCs, research centres etc. The study further stressed on technology integration: each company need to select its niche for its dedicated contribution (like Intel, world leader in microprocessors and Microsoft in Software had done).

Table 5.6 Comparative Technological Initiatives by Government and Industry in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka	U.P	Punjab	Haryana
1	State Government Initiatives	Several GoI sponsored Research institutes in IT and Electronics like : - Indian Institute of Sciences - Karnataka Council for Technological Upgradation - Centre for Electronics Test Engg. - Electronics and Radar Dev. Estb. - Centre for Development &Advanced Computing - Center for Artificial Intelligence and Robotics - Trade and Technology center for Electronics	A few GoI sponsored Research institutes in IT and Electronics like : - Indian Institute of Technology, Kanpur - Indian Institute of Technology, Roorkee. - Electronics Research and Development Centre, Noida - Electronics Test and Development Centre, Kanpur - CEDTI, Gorakhpur	A few GoI sponsored Research institutes in IT and Electronics like : - Electronics Test and Development Centre, Mohali - CEDTI, Mohali - SCL center for VLSI design Training - Test and Quality Assurance center, Ludhiana	A few GoI sponsored Research institutes in IT and Electronics like : - Instruments Design Development and Facilities Center, Ambala - Precision Mechanical Design and Associated Facilities Centre, Gurgaon - Electronics Research Dev. and Facility center, Gurgaon
2	Private Sector Initiatives	State has several private initiatives in R&D like : -Many MNCs have set up VLSI Design centers Indian Institute of Information Technology (By private sector)	Not Significant	Not Significant	Not Significant
3	Quality Certification	20 out of India based 46 SEI CMM Level 5 certified companies are located in Bangalore.	More than 3 available	NIL	More than 2 available

Source:

- *"Status Report of Electronics City at Bangalore",* KEONICS, 07December'1994.
- Brochure of Industrial Assistance Group, Department of Industries, Government of Haryana, 1997-98.
- Brochure of Udyog Sahayak, Department of Industries, Government of Punjab, 1997-98.
- Brochure of Udyog Sahayak, Department of Industries, Government of Punjab, 1997-98.
- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.

Results from Secondary Sources

Table 5.6 gives technological initiatives in the four states. It was observed that government of India has set up various national and international level R&D institutions in different hi-tech specialized areas of electronics and IT in Karnataka and a few in U.P. However, the states of Punjab and Haryana have been neglected in this regard. Semiconductor Complex, a central PSU has established facilities in the area of chip manufacturing in Mohali.

Private initiatives in creating R&D facilities in areas like VLSI design by national and international level companies are concentrated only in Bangalore and a very few in Gurgaon.

Twenty out of India based 46 SEI CMM Level-5 certified companies were found to be located in Bangalore, 5 in Delhi region but not a single in Punjab. According to the United Nation's Human Development Report-2000, Bangalore is the Fourth Global hub of Technological Innovations, just behind San Francisco, Austin (USA) and Taipei (Taiwan). According to the United Nation's Human Development Report-2000, Bangalore is the Fourth Global hub of Technological Innovations, just behind San Francisco, Austin (USA) and Taipei (Taiwan).

5.3.4.2 Qualitative Analysis of Data

Results from Opinion of Experts

Experts have suggested establishing Centres of Excellence in Mohali by private involvement to conduct research in the new emerging technologies. They also considered that as electronics technology is changing very fast, there is a need for development of in-house research in electronics and IT Industry.

Three software units from Bangalore and two from Noida emphasizes on creating technology centers of excellence where research and engineering of emerging technologies can be funded by state govt. and industry jointly. Dewang Mehta (2000) stressed on Indian software companies for creating of original technology, development of products and packages. Vittal (1999)

emphasized that developments in the areas of Graphic Intelligence based Script Technology, E-commerce and E-governance were needed to be targeted by Indian companies for further business. Indian Electronic and IT Industry need to concentrate on product design and development and research in the new emerging technologies. Results from secondary sources revealed that Package and product share in total software exports was found to be only 11%. To sustain India's high growth rate in software exports, India need to prove itself as good software product providers. To encourage software package development, experts suggested that government is required to announce some incentives for the units engaged in software package development.

5.3.5 HUMAN RESOURCE DEVELOPMENT

5.3.5.1 Quantitative Analysis of Data

Results from Primary Sources

As an outcome of the primary study, seventeen of the electronic units (59%) and sixteen software exporters (53%) out of the total sample units were found to be in favour of In-house training in companies to update technical skills of employees and suggested a special manpower incentives for such units which may include exemption of expenses on in-house training efforts from Income Tax or it could be a fixed percentage of annual turnover be exempted from income tax. Nine electronic (31%) and eleven software units (37%) out of a total sample of 59 units suggested maintaining a database of available manpower skilled in various specialized areas of electronics and software in the state. The findings of Ritu (1999) who had concluded that proper regular training to executives was required for high level of effectiveness in an organization supports results of the present study.

It was further found that twelve of the total 30 software units (40%) were of the opinion to attract leading IT companies for establishment of IT institutes in the states. One software unit based in Mohali suggested that Industrial training should be compulsory as part of curriculum in all branches in technical courses of degree and diploma level. Two of the seven experts have also

supported that Industrial training should be compulsory as part of curriculum in all branches in technical courses of degree and diploma level. The industrial training as part of curriculum in technical courses would well equip the students to give output from the day one of their joining an industry without spending time and money by the company on their familiarization or induction training.

Table 5.7 Comparative Human Resource Development in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka		U.P		Punjab		Haryana	
1	Literacy Rate	55.8% (Bangalore City: 77.51%)		40.7%		56.7%			
3	Educational institutions	Institutions	Intake	Institutions	*Intake*	Institutions	Intake	Institutions	Intake
	➢ Engg. Degree	111	40,385	83	22,491	33	8875	33	9385
	➢ Engg. Diploma	199	36,034	92	11,340	35	6776	23	5210
	➢ Medical Science	97	30,970	05	-	06	-	02	-
	➢ MBA	78	4621	97	7305	22	1335	22	1515
	➢ MCA	84	4385	91	5685	35	2050	31	1710
	➢ ITIs								
	➢ National level Institutions	300	1,20,000	202		111		-	
	• IIIT				-				
	• IIT /IISc	Bangalore		Allahabad		-		-	
	• IIM	Bangalore		Kanpur +		-		-	
		Bangalore		Roorkee		-		-	
				Lucknow					
2	Availability of Trained Skilled Manpower								
	- Fresh Technical Manpower	Excellent		Sufficiently available due to adjoining Delhi Resources.		- Sufficiently available		Sufficiently available due to adjoining Delhi Resources.	
	- Middle level (Degree+upto 5 years Exp.)	Excellent				- Shortage in High end specializations			
	- Senior level (Degree+More than 5 yrs.Exp	Excellent				- Acute shortage.			

Source:

- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.

Results from Secondary Sources

In Karnataka, a total of 394 technical institutes produce 80,804 manpower besides 4621 graduate annually coming out of 78 Management Schools as against 266 technical (39,516 intake) and 97 management (7305

intake) institutes in U.P., Punjab and Haryana generate 17,701 technical plus 1335 managers and 16,305 technical plus 1515 managers respectively. Table 5.7 gives status of HRD efforts in different sample states.

5.3.5.2 Qualitative Analysis of Data

Results from Opinion of Experts

Two of the seven experts (29%) have stressed on Industrial training compulsory as part of curriculum in all branches in technical courses of degree and diploma level. One of the software unit based in Mohali also supported the idea. The industrial training as part of curriculum in technical courses would well equip the students on joining industry without a need for wasting time on induction training by the company.

One of the experts pointed out that future will be for Knowledge based Industry instead of capital based. Experts also pointed out that availability of a large skill base in the state of Karnataka and Uttar Pradesh is the major reason for attracting new investments in IT Industry in these states. They have further expressed that there is a shortage of manpower of the level of project leaders in Punjab. It was suggested that shortage of manpower at entry level can be overcome by providing training in IT to all graduates during their studies. CRRID (2002) in its report on “Punjab State Development Report-2002” have forecasted that the development process including industrial development would increasingly depend not on capital resources but on knowledge resources.

5.3.6 FINANCE

5.3.6.1 Quantitative Analysis of Data

Results from Primary Sources

Twenty one of the total 30 software exporters (70%) emphasized on effective setting up of venture capital funds in the states for IT companies. Thirty-three of the total electronics and software units (56%) considered existing rate of interest on finance as very high. Nineteen units (32%) were

found to be upset on banks insisting on collateral security for raising finance and twenty one (36%) pointed out abnormal delays in processing of their finance applications. Two of the experts supported the fact and considered abnormal delays by Venture Capital Funds and Financial Institutions in processing the applications causes delay in implementation of the project and hence addition in cost. The experts suggested that the institutions need to workout some mechanism for fast track clearance of cases for sanction and disbursement of funds. The issues like red-tape and the higher cost of finance are the major causes for low growth of manufacturing industry and also failure of EHTP scheme in India was revealed by Vittal (1999). Past literature (DoE, 1985;Nambiar, 1985) also supported present finding that there is a need to bring down cost of finance for the Industry.

Table 5.8 Comparative Financial Support Available to Electronics and IT Industry in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka	U.P	Punjab	Haryana
1	Venture Capital Fund	Yes Karnataka IT venture Fund Rs. 150 million corpus	Yes. VCF of Rs. 200 million corpus + Infr.Dev.Fund of Rs. 50 million	Yes Rs. 200 million corpus.	No.
2	Financial Institutions	State Financial Corporation, State Industrial Development corporation and branches of all the major financial institutions of the country.	State Financial Corporation, State Industrial Development corporation and branches of all the major financial institutions of the country.	State Financial Corporation, State Industrial Development corporation and branches of all the major financial institutions of the country.	State Financial Corporation, State Industrial Development corporation and branches of all the major financial institutions of the country.

Source:

- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.

Results from Secondary Sources

Each of the four states under study there exist State Financial Corporation, State Industrial Development Corporation and branches of all the major financial institutions and banks of the country. Except Haryana, all other states have established a State Venture Capital fund to provide financial support to the software industry. Table 5.8 gives comparison of financial support available in the different states under study.

5.3.6.2 Qualitative Analysis of Data

Results from Opinion of Experts

Two of the experts considered abnormal delays by financial institutions particularly the VC Funds in dealing with the applications of industry for financial assistance and suggested that the state venture funds need to workout some mechanism for fast track clearance of cases for sanction and disbursement of funds. Thirty six percent of the units noticed delay in processing of cases. Vittal (1999) in his study revealed that the issues like red-tape and the higher cost of finance are the major causes for low growth of manufacturing industry and also failure of EHTP scheme in India. To resolve problem of higher cost of finance, a State Electronics Development Fund (SEDF) is suggested to be formed to subsidize the interest rate to the level of international rates both for term loan and working capital for small and medium electronics manufacturing Industry.

5.3.7 MARKETING

5.3.7.1 QUANTITATIVE ANALYSIS OF DATA

Results from Primary Sources

Three of the electronic units from Karnataka and one from Punjab have pointed out inconsistency in government demands and two of them have suggested that government buying be distributed equally throughout the year. Eleven of 29 electronics units (38%) located in Noida, Gurgaon and Mohali

considered competition with MNCs as a problem for the industry and 2 of them suggested restricting MNCs in areas where domestic industry is already strong.

Twenty one out of 30 software units (70%) were found to be exporting their major share of software to USA, 2 to Japan (7%), 3 to Singapore (10%) and 3 to other countries. One each electronic unit from Mohali and Gurgaon and 4 of Bangalore based and 2 of Noida based software export units emphasized on a strong Customer Relationship Management (CRM) to retain customers. CRM was found to be an unpopular concept in electronic units in both the states of Punjab and Haryana.

Ten of the total 30 software units (33%) pointed out that independent marketing in USA was very costly. Twelve units (40%) suggested more allocation of FE to software exporters for marketing abroad. One unit from Mohali suggested that a federation of software companies should be created on cost sharing basis for exporting through it. 73% of the software units considered marketing through company owned branch office abroad is the best marketing strategy.

Results from Secondary Sources

Table 5.9 gives marketing support extended to electronics and IT industry by the four states.

Table 5.9 Comparative Marketing Support Available to Electronics and IT Industry in Karnataka, U.P, Punjab and Haryana

SN	Description	Karnataka	U.P	Punjab	Haryana
1	SEDC as the nodal agency for procurement of electronic items for various government departments in the state.	Yes	UPDESCO, a state PSU act as a nodal agency for the purpose.	No	Yes
2	SEDC assisting SSI in marketing their electronics products.	Yes (1992-93) ➢ Marketing of telephone instruments, Small exchanges, Stabilizers, UPS, Fax machines, EPABX etc.	No	No	Yes upto some extent as HARTRON is the nodal agency.

Source:

- Official Website of Haryana Government, www.haryana.nic.in, 1998.
- Official Website of Punjab Government , www.punjabgovt.nic.in, 1998.
- Official Website of Karnataka Government, www.karnataka.nic.in, 1998.
- Official Website of Uttar Pradesh Government, www.uttarpredesh.nic.in, 1998.

In Karnataka and Haryana, the State Electronics Development Corporation are the nodal agencies for procurement of electronic items for various government departments in the respective state while UPDESCO perform the same work in U.P. No such organization in Punjab has been declared as the nodal agency. Karnataka and Haryana SEDCs assist electronic SSI units in marketing their products.

5.3.7.2 Qualitative Analysis of Data

Results from Opinion of Experts

An expert suggested following steps to overcome problem of small volumes of production in Indian electronics industry - through acquisition and mergers as small units can not survive; letting unviable units die out or merge; privatization of PSUs and relaxation of labor laws to permit hire and fire. Another expert suggested that industry should penetrate in wider rural market. Previous investigating studies (Seshagiri, 1975;DoE, 1985;Alum, Ghayhr and Dieter Ernst, 1990) had also found that low volume production of electronics products resulting in high production costs is one of the major cause for poor export performance of electronics industry. For survival of Indian electronics industry it is essential to increase production volumes to bring down cost and hence the price.

For resolving problems related to marketing and finance and to boost the small-scale sector of electronics and IT industry, the experts suggested that ancillarisation should be developed in both the states of Punjab and Haryana. Ancillarisation will also generate maximum employment opportunities in the respective states. An ancillary industrial unit, manufacture the sub-assemblies /items which is/are dedicated to the requirement of a large industrial unit to produce its final product. The production in the ancillary unit is as per the specification and close quality control of the large unit. Usually, even the raw material is supplied by the large unit for producing required sub-assembly/ Item

Experts during informal discussions suggested that major portion of India’s present software exports is to USA which is about 70-80% of total volume. Indian software exporters should not depend on only US market and explore for new business areas and locations. In his article, Srivastava (1999)

pointed out that India would be facing stiff competition from countries like Philippines and China because our salary costs had gone up and the quality of infrastructure was poor in comparison with the other countries. The author further stressed upon taking up seriously business in back office functions such as medical transcriptions, call centres, legal databases and Insurance claim processing. The states of Punjab and Haryana with lot of English medium public schools, can take up business in back office functions such as call centres and BPO (Business Process Outsourcing).

5.4 CONCLUSIONS

Problems being faced by the electronics and I.T. industry in each of the two low growth states under study i.e. Punjab and Haryana in respect of the existing policies, procedures, institutional support and Infrastructural facilities were discussed in detail during primary study with the sample units and experts both from electronics manufacturing and software export sectors.

The conclusions of Quantitative as well as Qualitative analysis have been drawn under seven heads i.e. Policies, Institutional Support, Infrastructural Facilities, Technology, Human Resource Development, Finance and Marketing.

5.4.1 **POLICIES** (State Electronics and IT Policies)

It was hypothesized that the state policies for the Electronics and IT Industry in the states of Karnataka, Uttar Pradesh, Punjab and Haryana are identical. But the results explored that while IT policies in the states of Karnataka and Haryana are similar, policies of other two states are different as Uttar Pradesh having specified time bound targets and Punjab formulating a combined policy for the three sectors of Electronics, IT and Biotechnology. Thus, the hypothesis stands rejected.

1) IT policies of Punjab and Haryana are similar to that of Andhra Pradesh, Karnataka. In fact they seem to be influenced by the policies of the two

affluent states of Karnataka and Andhra Pradesh. All the states focus on inviting investments in the IT sector in their respective state through private participation and promote IT in education, Government and in Industry and offer more or less same type of incentives to the industry. Every state was found to have emphasized on implementing e-governance in their respective states. Punjab's initiative to commit in its IT Policy-2003, same preferential support to electronics manufacturing industry as available to IT industry, is considered by experts and industries as a right step by the government to help electronics sector out of recession. None of these policies give clear cut implementation modalities and this difficulty has been clearly brought out in the primary study.

2) The states of Karnataka, Uttar Pradesh and Haryana have formulated separate policies for Electronics, IT and Policy for general Industry. However, Punjab has adopted a different approach by notifying a common state policy for Electronics, Information Technology and Biotechnology.

3) Uttar Pradesh specified time bound targets in their IT Policy-1999 with regards to IT in government, education and Industry. The primary study revealed that not much has been still done to meet these targets.

4) Both Quantitative as well as Qualitative analysis revealed that a government policy on paper is of no use unless it is timely and effectively implemented on ground**.** Incentives play a marginal role if an entrepreneur could start his industry six month earlier than the present system. The enterprise will earn more than the incentives in financial terms. Therefore, the present study found that there is a need for time bound effective Implementation of the state Policies.

5) All the four states have committed for initiating power reforms to provide sufficient and quality power without any power cuts for IT industry. However, the study revealed that only Haryana had taken concrete steps through restructuring of Haryana State Electricity Board with a phased plan to involve private enterprise in distribution of electricity.

6) Industry suggested that to sort out power crises in the state, government may either subsidize production of CFL as has been done in Kerala or may itself be a major buyer to stimulate demand of the product.

7) The experts opined that import tariff structure in the electronics industry should be such that it encourages investment in domestic component industry. Duty structure should be lowest for the raw materials, a little higher for components, still higher for kits and highest in finished equipments. This strategy shall encourage domestic manufacturing and prove competitive in cost to imports.

8) Software units proposed the state policy to provide industry friendly environment and flexibilities in labour laws to allow three shift working for all men and women so that twenty four hour virtual office concept for Indian software exporters become a reality.

9) Findings of the present study revealed that the four states of Punjab, Chandigarh, Haryana and Himachal Pradesh should make joint efforts with regional approach for the development of Electronics and IT industry in the Mohali-Chandigarh-Panchkula-Baddi region instead of individual efforts. Past studies had also supported that instead of a state wise, isolated approach to industrial development, a collaborative, interdependent approach for the region as a whole should be put into place. To achieve this, the four states may jointly workout a region based 'IT and Electronics Policy' for development of this segment of Industry in Mohali(Punjab), Chandigarh, Panchkula (Haryana) and Baddi (Himachal Pradesh) region.

10) The past studies has also supported the present study's finding that there is further scope for setting up VLSI production base in the Punjab state.

5.4.2 **INSTITUTIONAL SUPPORT** (Facilitation role by the Government)

It was hypothesized that a better Institutional support is provided in the states of Karnataka and Uttar Pradesh to Electronics and IT Industry in

comparison with the states of Punjab and Haryana. The results explored that Institutional support provided in the states of Karnataka and Uttar Pradesh is better than that available to Electronics and IT Industry in the two states of Punjab and Haryana. Thus, the hypothesis stands proved.

1) Electronics and software units (61%) from the four states suggested that SEDC should interact with industry more frequently and the agencies need to make aware the industry about the kind of support they can give to them.

2) Industry in Mohali suggested that leadership in SEDC should continue in office atleast for three years to proper plan schemes and implement them effectively. It was found that Punjab's SEDC witnessed 13 changes in its leadership in last about 11 years period. Experts from electronics industry also suggested continuity and technical orientation of SEDC.

3) It was observed that industry particularly Punjab and Haryana's software exporters were facing abnormal delays in customs clearances and therefore, units were of the opinion that customs related problems of software exporters should be handled by STPI under its single window concept.

4) For proper implementation of electronics and IT units, industry suggested government to take effective steps to remove red tapism and corruption at all levels and simplifies procedures.

5) As per units of the hi-tech sector which was duly supported by the past studies, it is the high time to switch from bureaucratic to professional working in government agencies.

6) It was suggested that an advisory team /committee comprising of professionals from private electronics and IT industries and academic /research institutions should be formed to advise the government on improvements in the electronics and IT sector in the states. Government should ensure that the advisory group /committees meet regularly.

7) Experts from electronics industry (43%) suggested that as a short-term strategy, the state should save existing units and promote services sector where manpower availability finds an advantage. And, as a long-term strategy, the states of Punjab and Haryana should consolidate to make larger viable units and enter international market with a large competitive base of technical manpower in services sector.

8) Eight electronic and six of software units (24%) from the sample suggested to encourage best performers, by constituting an award "Best Software/Electronics Unit of the Year" to be awarded annually to best of two units from each of the Electronics and Software segment.

9) Political uncertainty was found to be the major hindrance in development of Electronics and IT Industry in the state of Punjab as expressed by the experts as well as 58% of the sample Industry.

10) Experts indicated following major weaknesses hindering development of electronics and software industry in India:
    - Small fragmented production units,
    - High cost of capital,
    - Lack of capital intensive high tech R&D facilities,
    - Bureaucratic delays in decision making and
    - Inverted duty structure (promotes gray market).
    - Non-availability of components, semi-conductors and other chips in domestic market as these are largely being imported

5.4.3 INFRASTRUCTURAL FACILITIES

It was hypothesized that the Infrastructural facilities related to Electronics and IT Industry in Karnataka and Uttar Pradesh are better than those in the states of Punjab and Haryana. The results explored that industry specific infrastructure in Punjab and Haryana was inferior to that available in

the states of Karnataka and Uttar Pradesh. Thus, the hypothesis stands proved.

1) Incubation facilities and IT Parks to provide Plug-and-Play facilities to IT export units were found to have been established by all the states under study except Punjab.

2) Electronics Hardware Technology Parks to house electronics hardware exporters were also observed to have been successfully established by all the states except Punjab and Haryana.

3) Non availability of an International Airport in and around Mohali was found to be the major hindrance in development of software exports Industry in the state of Punjab.

4) Social infrastructure like big hotels, clubs/pubs, golf course, lake etc. was found to be adequate in all the four locations except that big hotels are not available in Mohali /Chandigarh. Keeping in mind requirements of high standard infrastructure, twenty years ahead, it was found that to achieve this, concentrated efforts should be made for which independent Development Authorities for Moahli and Gurgaon need to be established.

5) Public Transport facility from residential locations to the industrial centers was observed to be poor in all the four sample locations except Noida (UP) and Gurgaon which enjoy the facilities provided by Delhi Transport Corporation.

6) Frequent power cuts and poor quality of power supply was the common difficulty being faced by atleast 53% units. It was observed that this has substantial adding to their cost due to expenses on maintaining generators.

7) Power tariff was observed to be the lowest in Punjab among the four states.

8) Experts expressed that in view of tax benefits under STP scheme available in India only up-to 31-3-2010 as per government of India policy, to retain existing software export Industry and further growth in Electronics and IT Industry particularly in Punjab, the state should establish 'Special Economic Zones (SEZ)' specifically for Electronics and IT Industry in Mohali. This scheme will provide tax benefits to exporters for 20 years period.

5.4.4 TECHNOLOGY (R&D Facilities for Electronics and IT Industry)

It was hypothesized that Electronics and IT Industry in the states of Karnataka and Uttar Pradesh have better R&D facilities than those of the states of Punjab and Haryana. Results explored that with the initiative of private sector, Karnataka and Uttar Pradesh much better research facilities than those in Punjab and Haryana. Thus, the hypothesis stands proved.

1) Private initiatives in creating R&D facilities in areas like VLSI design by national and international level companies are concentrated only in Bangalore and a very few in Uttar Pradesh. Punjab and Haryana need to encourage investment in R&D facilities by private sector.

2) Experts suggested establishing Centres of Excellence in Mohali by private involvement to conduct research in the new emerging technologies. The efforts can be supported by state govt. and industry jointly as has been done by the states of Karnataka and Uttar Pradesh.

3) Twenty out of India based 46 SEI CMM Level-5 certified companies were found to be located in Bangalore. About 5 in Delhi region and not a single in Punjab.

4) In-house R&D culture in electronic manufacturing units is essentially required to cope up with the pace of technology development in this segment of Industry.

5) According to the United Nation's Human Development Report-2000, Bangalore is the fourth global hub of technological innovations, just behind San Francisco, Austin (USA) and Taipei (Taiwan).

6) The perception about Indian products in international market was that the products were of inferior quality and IT units consider Indian software units also lacked in commitments.

7) The electronic & software units suggested that the quality certification by an international agency should be made mandatory for this sector.

8) Industry (31%) in support of past studies suggested that Government should create and maintain a database on the sources of technology available for transfer to the electronic units from within and outside India.

9) Electronic Industry support the concern of experts and considered that higher cost of raw material was one of the reason for downfall of small and medium electronic manufacturing units.

10) Package and product share in total software exports was found to be only 11%. To sustain India's high growth rate in software exports, India needs to prove itself as good software product providers. To encourage software package development, government should announce some incentives for the units engaged in software package development. Past study (Dewang Mehta, 2000) had also stressed on Indian software companies for creating of original technology, development of products and packages.

11) Semiconductor Complex, a central PSU has established facilities in the area of chip manufacturing in Mohali and have recently initiated training facilities in the area of VLSI design.

12) Electronic units (52%) recommended special technology incentive for creating in-house R&D facilities which may be exempting expenses on R&D efforts from Income tax.

5.4.5 HUMAN RESOURCE DEVELOPMENT

It was hypothesized that there exists difference in the Human Resource Development related to Electronics and IT Industry in the four states of Karnataka, Uttar Pradesh, Punjab and Haryana. The results explored that the skill base in the four states namely Karnataka, Uttar Pradesh, Haryana and Punjab is in decreasing order. Thus, the hypothesis stands proved.

1) Experts pointed out that availability of a large pool of skilled manpower at all levels in the state of Karnataka and Uttar Pradesh is the major reason for development of IT Industry in these states. They have further expressed that there is a shortage of manpower of the level of project leaders in Punjab. It was further suggested that shortage of manpower at entry level can be overcome by providing training in IT to all graduates during their studies.

2) Results from the secondary sources revealed that in Karnataka, a total of 394 technical institutes produce 80,804 manpower besides 4621 graduate annually coming out of 78 Management Schools as against 266 technical (39,516 intake) and 97 management (7305 intake) institutes in U.P., Punjab and Haryana generate 17,701 technical plus 1335 management graduates (MBA) and 16,305 technical plus 1515 MBAs respectively.

3) Both electronics (59%) and IT units (53%) were of the view that to encourage in-house training, expenses incurred for in-house training to update knowledge & skills of its people should be exempted from income tax.

4) The industry suggested maintaining a database of available manpower skilled in various specialized areas of electronics and software in the state.

5) The units were of the view that leading IT companies should be invited to setup IT institutes in the states.

6) Experts (29%) and Industry (40%) stressed on Industrial training to be compulsory as part of curriculum in all branches in technical courses of degree and diploma level.

7) One of the experts opined which was also supported by past study that future will be for Knowledge based Industry instead of capital based.

5.4.6 FINANCE

It was hypothesized that financial facilities available for Electronics and IT Industry in the states of Karnataka, Uttar Pradesh, Punjab and Haryana are similar. Results have shown that out of the four states under study, Haryana alone has so far not floated a Venture Capital Fund for IT Industry. Thus, hypothesis stands rejected.

1) Experts and Industry suggested that Haryana state should also set up a State Venture Capital Fund for the Electronic and IT Industry. The other states of Karnataka, Uttar Pradesh and Punjab have already established such funds in their respective states to provide financial support to IT and Electronics Industry.

2) Software exporters emphasized on effective setting up of venture capital funds in the states for IT companies.

3) The electronics particularly software units considered existing rate of interest on finance as very high. They also felt banks insisting on collateral security for raising finance and abnormal delays in processing of their finance applications were the other major problems faced by entrepreneurs. Creation of a state electronics development fund needs to be considered.

4) Experts and Industry suggested that the state venture funds in Punjab need to workout some mechanism for fast track clearance of cases for sanction and disbursement of funds.

5.4.7 MARKETING

It was hypothesized that Marketing strategies of Electronics and IT Industry in the states of Karnataka and Uttar Pradesh are better than those of Punjab and Haryana states. Results of the study have found that growth of Electronics and IT industry is the highest in the state of Haryana amongst the sample states. Thus, the hypothesis stands rejected.

1) The results have indicated that Punjab has the lowest growth rate in all segments of electronics production. The rate of growth was found to be less than the national growth in all the segments of electronics industry. Haryana on the other side had impressive growth in all segments. It is not only higher than Punjab but higher of all the four states. Its growth is highest in five out of six segments i.e. consumer electronics, communications, components, computer hardware, strategic electronic and software export and even in Industrial electronic segment; it is near the national growth rate.

2) From results of secondary data, it was noted that the state Electronics Development Corporations in the states of Karnataka, and Haryana do assist small scale electronic industrial units in marketing their products and also act as the nodal agency for procurement of electronic items for various government departments in the respective state. In Uttar Pradesh, however, another state agency namely UPDESCO has been declared as the nodal agency for procurement of electronics items for the state government departments. Such facilitating activities are not being undertaken in Punjab.

3) Inconsistency in government demands was observed to have been a problem for the industry and therefore, suggested that government buying be distributed equally throughout the year.

4) Cost of export marketing to USA and Europe was considered to be very higher and therefore, suggested for more allocation of foreign exchange to

software exporters for marketing abroad. It was further suggested by software exporters that a federation of software companies should be created on cost sharing basis for exporting through it.

5) 70% of the software exporters were found to be exporting their major share of software to USA, 7% to Japan, 10% to Singapore and balance to other countries.

6) Some of the software export units emphasized on a strong Customer Relationship Management to retain existing customers and for repeat business.

7) 73% of the software units considered marketing through company owned branch office abroad is the best marketing strategy.

8) For resolving problems related to marketing and finance and to boost the small-scale sector of electronics and IT industry, the experts suggested that ancillarisation should be developed in both the states of Punjab and Haryana. Ancillarisation will also generate maximum employment opportunities in the respective states.

9) Experts from electronics industry suggested following steps to overcome problem of small volumes of production in Indian electronics industry:
    - Through acquisition and mergers as small units can not survive,
    - Letting unviable units die out or merge,
    - Privatization of PSUs,
    - Relaxation of labor laws to permit hire and fire
    - Penetrate in rural market.

CHAPTER - 6

ANALYSIS OF STATE LEVEL GROWTH IN ELECTRONICS AND I.T. INDUSTRY

The objective of the study was to know the growth of the Electronics and Software industries in the states of Karnataka, Uttar Pradesh, Punjab and Haryana. Post-liberalisation trend in electronic production in these states and their contribution in the national production have been compared and thoroughly analysed. Further, sectoral growth of this industry in each of the four states have been examined and presented. The productivity and employment generation by this sector in the above states during the same period have been analysed. Electronics product range being produced in these states has been critically examined to foresee potential and future for a specific sector in a particular state. Conclusions from primary data and views of the experts of the field have been critically analysed and supplemented to arrive at specific findings. Based on these findings, certain specific inferences have been drawn and suggestions made for increasing growth of this sector of industry in the states of Punjab and Haryana.

6.1 Electronics Scenario and Product Range Produced in the States

6.1.1 Karnataka

Karnataka, with Bangalore, Hubli, Mysore and Mangalore as its major Industrial towns is a site of 978 large and medium and 2,10,173 small scale industries. There are 23 Central Public Sector Units (PSUs) and 30 state PSUs. Out of total 978 large & medium Industries, 109 are in electronics manufacturing and 225 engaged in Information Technology (I.T.). It was observed that as on May'2002, STP units of the state have made a capital investment of Rs. 13830 million. This investment includes Rs. 8290 million as foreign equity.

Bangalore has become a preferred location for Multinationals for investment in Electronics in general and I.T. in particular. Major MNCs who

have established their manufacturing facilities in Bangalore are: Yokogawa, Texas Instruments, Bull, Sanyo, Moog, Digital, Bells Control, Asea Brown Boveri, Fanuc, 3M, Motorola, IBM and Hewlett Packard. WIPRO, Infosys, L&T and Defence set-ups like HAL, BEML, ITI, BEL, BHEL, ITI and HMT have chosen Bangalore as their Headquarter and established their manufacturing units here. Besides, major R&D units like National Aeronautics Lab, C-DoT, LRDE (Radar Development Establishment), ADE, CEDT and Institute of Artificial Intelligence and Robotics have provided R&D support to these companies. The above industries are mainly engaged in Telecommunication and Industrial Electronics manufacturing and in I.T. for Computer and other allied hardware manufacturing and Software Development.

6.1.2 Uttar Pradesh

In Uttar Pradesh, Noida has become the center of IT companies in the northern India. A total 2281 large & medium Industries and 3,72,134 SSI are located in UP giving employment to 22,17,351 persons. These units have made an investment of Rs.413,700 million.

Noida was found to be the biggest centre in India for manufacture of Television and electronic components. The Electronics & I.T. Industries in the state provide whole range of Electronic Components, Consumer Electronics and Information Technology hardware & software. Big houses like HCL, NTPC, Moser, Baer, Onida, Salora, Tata Infotech, Cadence, BPL, Super Cassettes, Polaris, Network Programs and Metamor have located their manufacturing/development sites in Noida.

6.1.3 Punjab

In Punjab, Ludhiana, Jalandhar and Mohali are the major industrial towns. Electronics and IT units of the state are concentrated in Mohali which is located adjoining Chandigarh. The electronics companies located in Mohali are mainly engaged in manufacturing of telecommunication equipments, electronics components and software development for exports. A total 604

large & medium Industries and 1,97,000 SSI are located in Punjab making an investment of Rs.143420 million and generating an employment for 10,90,000 persons.

The electronics companies in Mohali are in the hi-tech area in the field of computer peripherals, communications, electronic typewriters, EPABX, Ni-Cd. Batteries, Uninterrupted Power Supplies, colour picture tubes for television with know-how from world renowned companies like Westinghouse (USA), Granger Associates (USA), OKI (Japan), ARE (Italy), Hitachi (Japan) and Fujitsu (Japan) etc. Department of Electronics has also set up Semi-Conductor Complex Limited in the area for the manufacture of very large scale Integrated Circuits (VLSI).

Out of eight subsidiaries of the state electronics development corporation i.e. PSEDPCL, five (PBEML, PEOSL, PPPL, Zimag and Intermagnetics) engaged in manufacturing of medical equipments, electro-optics equipments and Ni-Cd batteries etc. have closed their operations due to various reasons. Two subsidiaries viz. PUNWIRE and ESPL of PSIDC engaged in manufacturing of communication equipments and computer hardware have also closed their operations. Five of the six joint venture companies of PSEDPCL were also found to have closed their operations. These six companies were engaged in manufacture of telecommunication /IT equipments for 100% exports. The only joint venture company of the electronics corporation left today is engaged in manufacturing of precision sheet metal and has been referred to BIFR. Three of the six major private sector electronics manufacturing companies located in Mohali were also found to have closed their operations. Software companies in Mohali (Punjab) started their operations after establishment of the STPI centre and an Earth station in Mohali during October'1998.

6.1.4 Haryana

After emerging as as separate state in 1966, the first major step taken by Haryana towards industrialisation was 100% rural electrification and

metalled roads to all its villages and towns by 1970. Haryana has projected Gurgaon as a centre for Electronics and I.T. Industries. A few of Electronics units have their manufacturing centres in Faridabad but the units under this sector are concentrated in Gurgaon particularly Electronics City and Udyog Vihar. As per the state's annual administrative report-1997, the number of medium & large scale units in the state has increased from 162 in 1966 to 1020 in 1998 with a capital investment of Rs. 200 billion and that of small scale & rural industries from 452 to 70,00 million providing an employment to about one million people.

The existing electronics industry in the state is manufacturing products covering mainly Consumer Electronics and Industrial Electronics. The only central PSU in Electronics sector set up in Haryana is Bharat Electronics Ltd at Panchkula Big names in this sector operating in the state includes: Alcatel-Modi, Bharti Telecom, Shyam Telecom, Kelvinator, of India HCL Weston, Usha Rectifier, TCS, DCM, Altos, CG Hertman, Bhurji Electronics, Bergen Electronics, Hughes Software, SQL star International and XO Tronics.

Products like Electronics push button telephone Instruments, Acoustic transducer, microphone, Computers & allied products, Electronics Instruments, Process Control Instruments, Electronics Cash registers, Audio magnetic tapes, Professional grade electronic equipments for Defence, TDMA systems, Electronics Pollution monitoring instrument and ware soldering machines.

6.2 Comparative Growth of Electronics Industry in the States

The Indian electronics and IT industry was found to be the fastest growing sector of Indian industry. In the following sections, performance of electronics and software in domestic as well as exports market and its sectoral growth in each of the four states have been discussed.

6.2.1 Performance in Electronics Hardware Production

Punjab had a negative growth rate of –0.88% during the period 1992-2001, where as Haryana was able to have a growth rate of 25.44% during the same period, the highest among the 4 states. As such Punjab's share in national production fell from 3.5% in 1992 to 1.2% in 2001 and that of Haryana rise from 1.4% to 3.8% in the same period (Table 6.1).

During 1992-2001, the production in prosperous states of Karnataka and U.P had a growth rate of 10.6% and 13.83% respectively.

The growth of electronics hardware production at the national level was found to be 12.24%, thus Punjab and Karnataka had a growth of less than the national growth rate, whereas Haryana and U.P. achieved higher growth rate than the national level. The growth pattern is depicted in Figure 6.1 and 6.1-A.

Table 6.1 Comparative Growth Trend of Electronics Hardware Production in the States of Karnataka, Uttar Pradesh, Punjab and Haryana

(Value in Rs. Million **)**

State	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**CAGR (%)**
PUNJAB	4027	5187	7348	8112	7010	8080	6550	5680	6000	3720	
- %Growth	11.2	28.8	41.7	10.4	-13.59	15.3	18.9	-13.2	5.6	-38.0	-0.88
- %Share	3.5	3.9	4.7	4.7	3.6	3.7	2.6	2.1	2.0	1.2	
HARYANA	1592	1498	2233	2515	3500	7637	8680	13130	14300	12250	
- %Growth	-6.6	-5.9	49.1	12.6	39.2	118.2	13.7	51.3	8.9	-14.3	25.44
- %Share	1.4	1.2	1.5	1.5	1.8	3.5	3.5	4.7	4.7	3.8	
KARNATAKA	23040	25977	29070	32628	40320	41850	42730	47750	54100	57010	
- %Growth	31.66	12.75	11.90	12.2	23.57	3.79	2.10	11.75	13.30	5.73	10.6
- %Share	20.4	20.0	18.8	18.8	20.7	19.4	17.2	17.2	17.9	17.8	
U P	21008	25381	28093	31647	29300	38740	54520	60350	58440	67440	
- %Growth	10.7	20.8	10.7	12.63	-7.42	32.2	40.7	10.7	-3.2	15.4	13.83
- %Share	18.6	19.5	18.2	18.2	15.0	18.0	22.0	21.8	19.3	21.1	
INDIA	113150	130200	154400	173900	194300	215860	248000	277500	303000	320000	
- %Growth	17.6	15.06	18.59	12.63	11.73	11.10	14.88	11.90	9.19	5.61	12.24

Source : Data Bank and Information Division, DIT, Government of India.

Note: Production related to 1995 is on average basis. Software domestic and exports are not included.

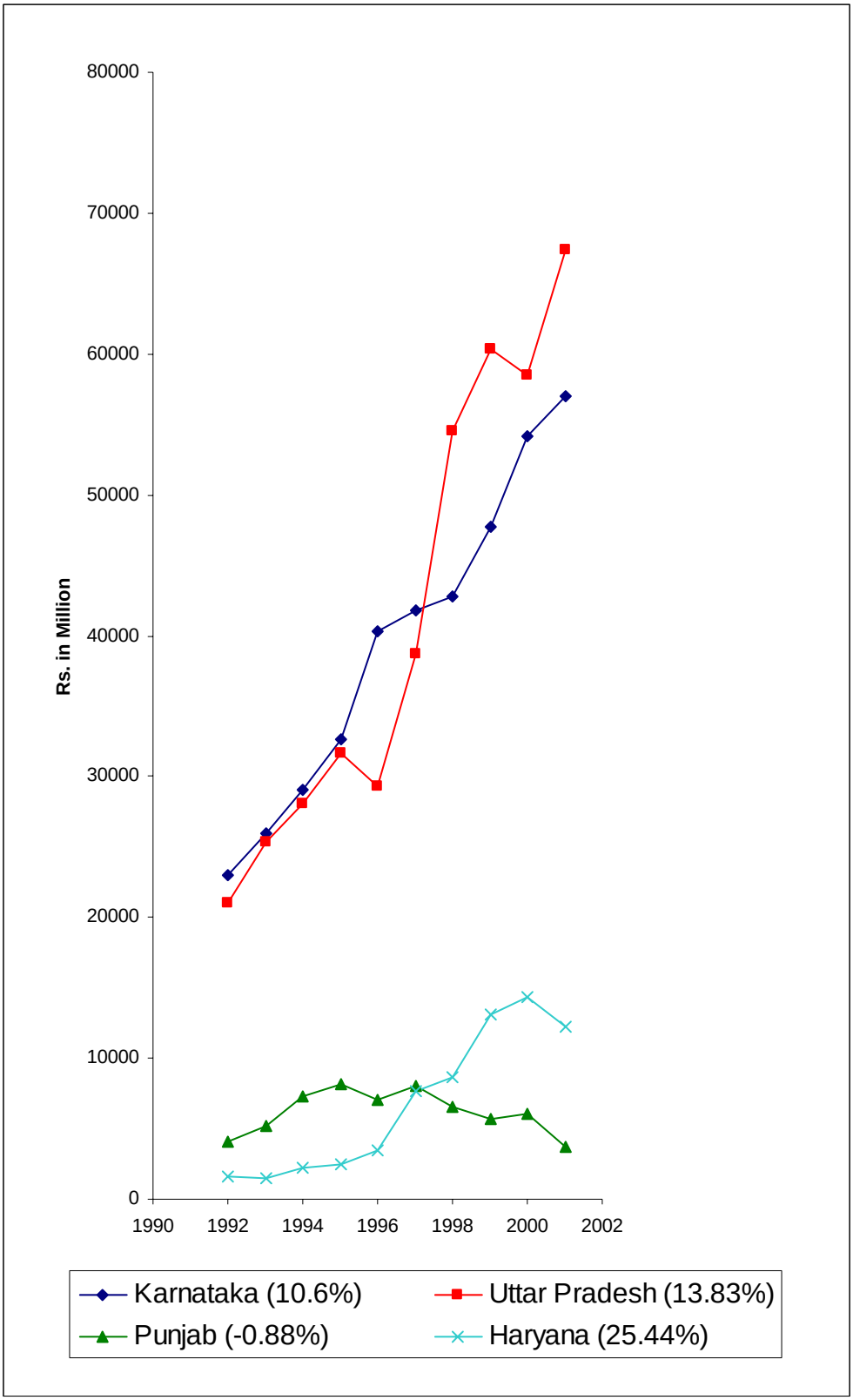


Figure 6.1 Growth of Electronics Industry in Karnataka,U.P.,Punjab and Haryana

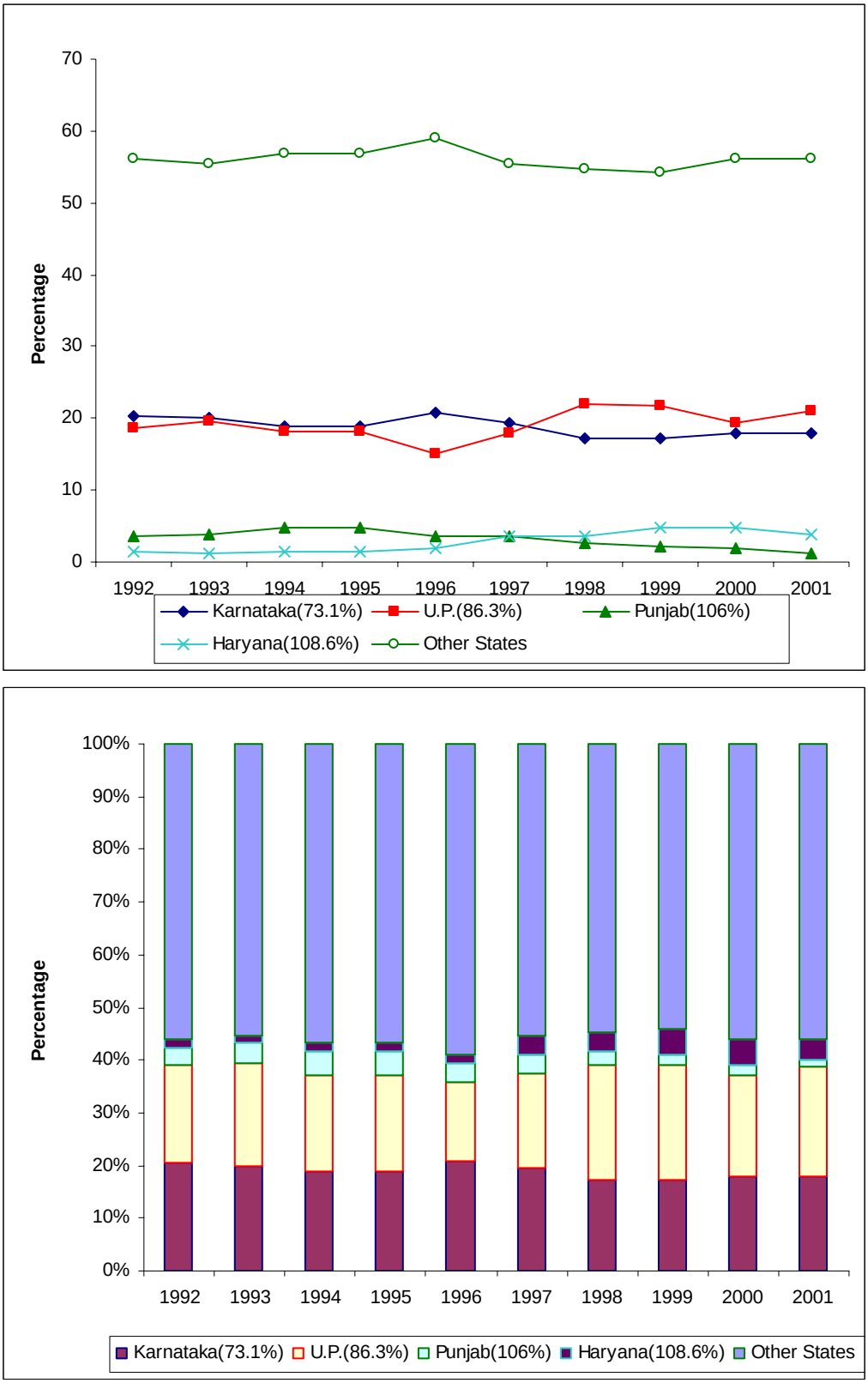


Figure 6.1-A Contribution of Various States in National Electronics Production

6.2.2 Sectorwise Growth Trend in Electronics and IT Industry

6.2.2.1 Consumer Electronics

The sectorwise growth trend in consumer electronics industry is given in Table 6.2 and Figure 6.2. Punjab had a growth rate of 6.38% during the period 1992-99, whereas Haryana achieved a growth rate of 57.02% during the same period, the highest among the states under study. Punjab's share at the national level in consumer electronics production fell from 1.47% in 1992 to 0.69% in 1999, whereas Haryana's share rose from 0.72% to 5.18% during the same period. During 1992-99 Karnataka and Uttar Pradesh had growth rate of 14.29% and 30.90% respectively.

Growth at national level was observed to be of 18.46%. Punjab and Karnataka had a growth less than the national growth rate, whereas, Haryana and U.P. achieved growth rates higher than the national level.

Table 6.2 Statewise Growth Trend in Consumer Electronics Industry

(Value in Rs. Million**)**

SN	State	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**CAGR (%)**
1	**Karnataka**	4317.9	5142	6349.5	7151.4	8050	8150	10670	11000	
	- %Growth	-	19.08	23.48	12.63	12.57	1.24	30.92	3.09	**14. 29**
	- %Share	12.85	13.08	14.08	12.87	12.48	10.94	11.86	10	**-**
2	**UP**	4096.6	4838.6	4750	5349.9	8020	13220	22020	27000	
	- %Growth	-	18.11	-1.83	12.63	49.91	64.84	66.57	22.62	**30.90**
	- %Share	12.19	12.31	10.53	9.63	12.43	17.74	24.47	24.55	**-**
3	**Punjab**	493	748	900	1013.67	980	350	470	760	
	- %Growth	-	51.72	20.32	12.63	-3.32	-64.29	34.29	61.7	**6.38**
	- %Share	1.47	1.9	2	1.82	1.52	0.47	0.52	0.69	**-**
4	**Haryana**	242.2	289	260	292.84	340	3980	2850	5700	
	- %Growth	-	19.32	-10.03	12.63	16.1	1070.6	-28.39	100	**57.02**
	- %Share	0.72	0.74	0.58	0.53	0.53	5.34	3.17	5.18	**-**
5	**India**	33600	39300	45100	55550	64500	74500	90000	110000	
	- %Growth	-	16.96	14.76	23.17	16.11	15.5	20.81	22.22	**18.46**
	- %Share	29.7	30.18	29.21	31.94	33.2	34.51	36.29	39.64	

Source: Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

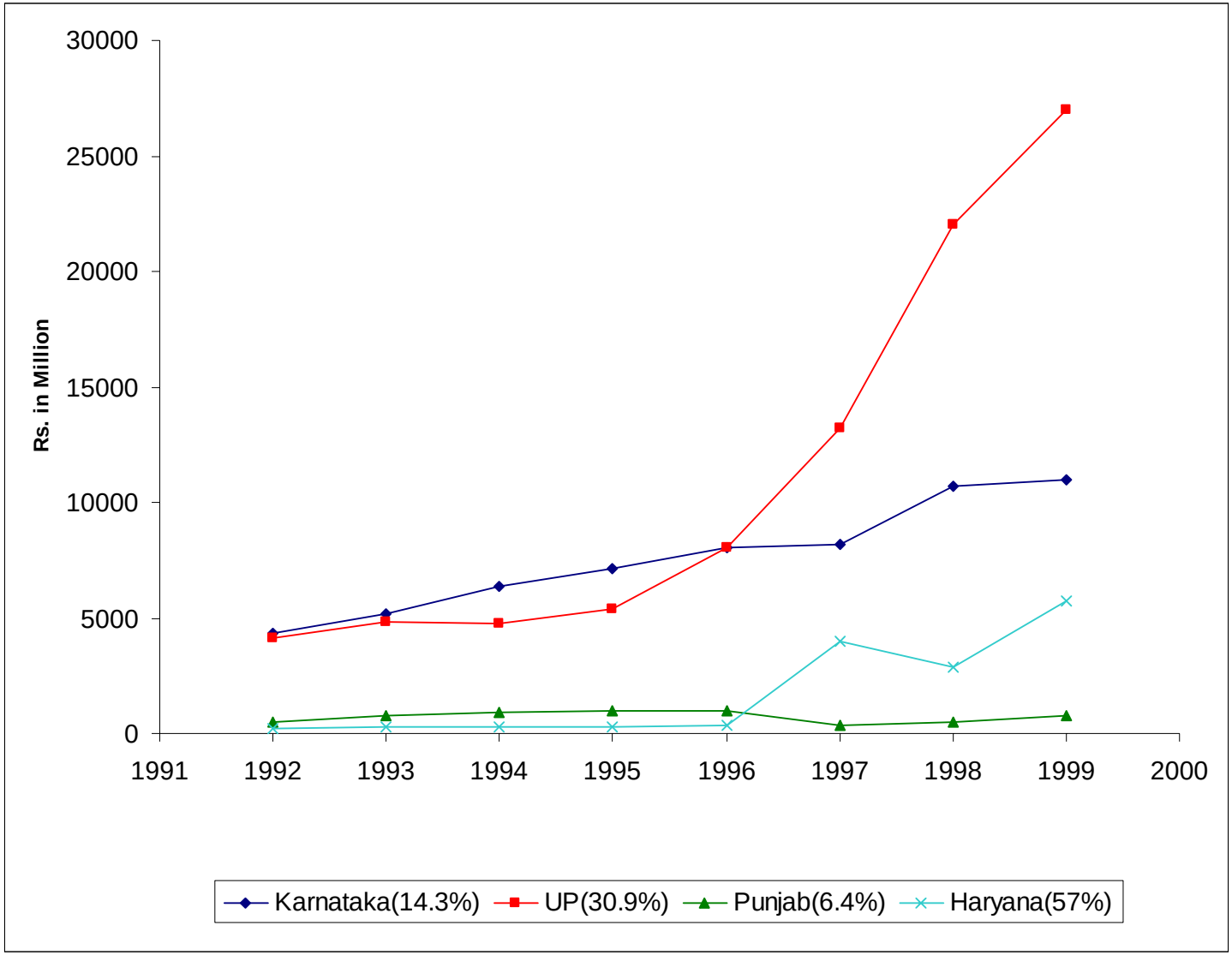


Figure 6.2 Growth Trend in Consumer Electronics Production in the States

6.2.2.2 Industrial Electronics

The sector-wise growth trend in Industrial electronics industry is given in Table 6.3 and Figure 6.3. During 1992-99 Punjab had a growth rate of –3.15%, whereas Haryana achieved a growth rate of 12.66%. Punjab's share in the national production fell from 1.08% to 0.37% whereas Haryana's share had a minor fall from 3.55% to 3.52%. The states of Karnataka and Uttar Pradesh had growth rates of 18.63% and 10.29% respectively.

The growth of industrial electronics production at the national level was found be 12.78%, thus Punjab, Haryana and U.P. showed growth rates less than the national level and only Karnataka clocked a rate higher than the national growth rate.

Table 6.3 State-wise Growth Trend in Industrial Electronics Industry

(Value in Rs. Million **)**

SN	States	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%)
1	**Karnataka**	2932.5	2711	3250	3660.5	9330	8430	7950	9700	
	- %Growth		-7.55	19.88	12.63	154.88	-9.65	-5.69	22.01	**18.63**
	- %Share	18.16	15.76	16.05	14.27	30.29	27.02	24.24	25.87	
2	**UP**	1999.1	2185.8	2950	3322.6	3240	3850	3830	3970	
	- %Growth		9.34	34.96	12.63	-2.49	18.83	-0.52	3.66	**10.29**
	- %Share	12.38	12.71	14.56	12.95	10.52	12.34	11.68	10.57	
3	**Punjab**	175.2	86	90	101.37	100	100	120	140	
	- %Growth		-50.91	4.65	12.63	-1.35	0	20	16.67	**-3.15**
	- %Share	1.08	0.5	0.44	0.39	0.32	0.32	0.37	0.37	
4	**Haryana**	573	574	750	844.73	780	700	890	1320	
	- %Growth		0.17	30.66	12.63	-7.66	-10.26	27.14	48.31	**12.66**
	- %Share	3.55	3.34	3.7	3.29	3.53	2.24	2.71	3.52	
5	**India**	16150	17200	20250	25650	30800	31200	32800	37500	
	- %Growth		6.5	17.73	26.67	20.08	1.3	5.13	14.33	**12.78**
	- %Share	14.27	13.21	13.12	14.75	15.85	14.45	13.23	13.51	

Source : Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

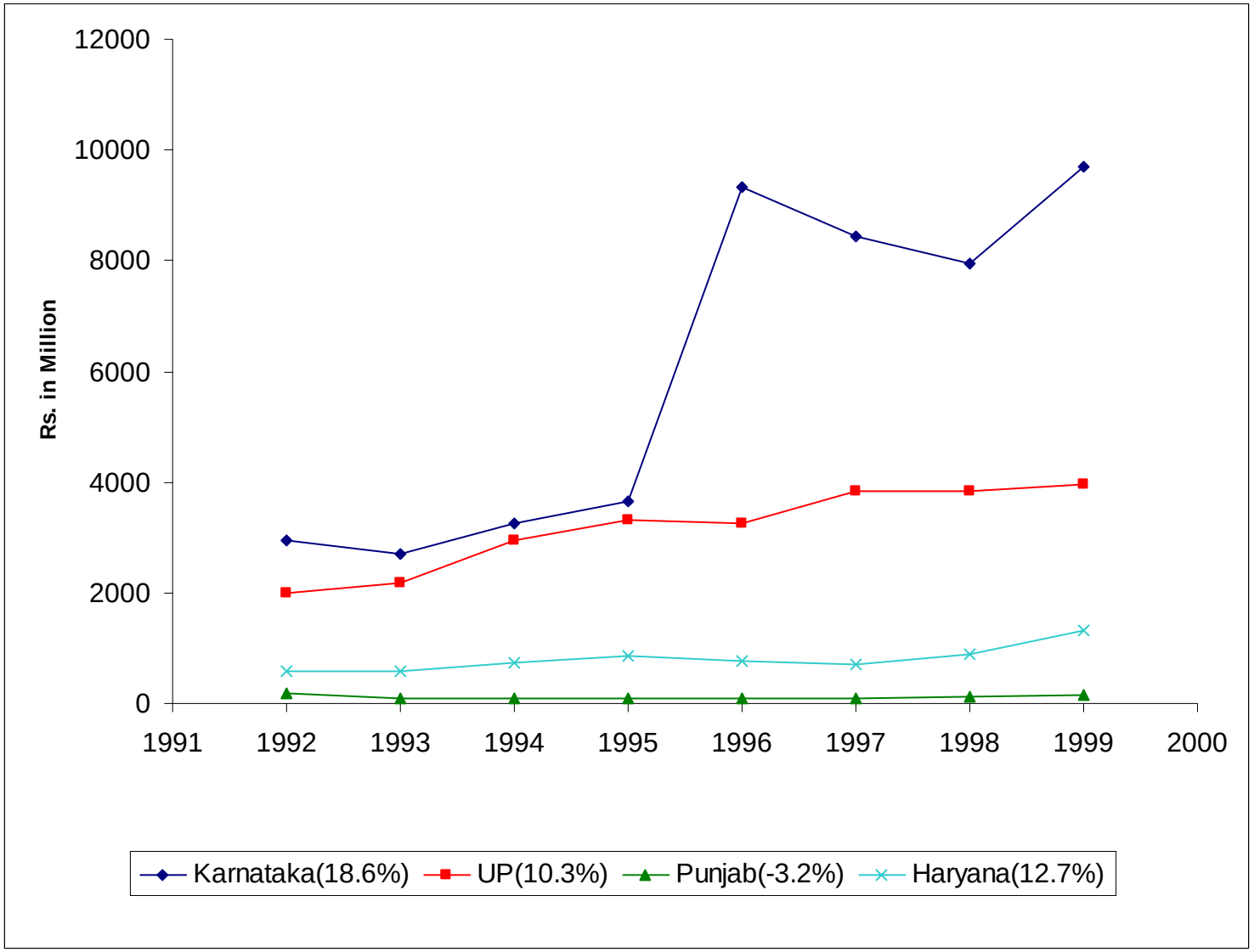


Figure 6.3 Growth Trend in Industrial Electronics Production in the States

6.2.2.3 Electronics Communication

The sector-wise growth trend in electronics communication industry is given in Table 6.4 & Figure 6.4. During 1992-99 Punjab achieved a growth rate of 4.60%, whereas Haryana had an impressive growth rate of 33.15%, the highest among the four states. Punjab's share in the National Production fell from 5.07% to 4.38%, whereas that of Haryana rose from 2.07% to 9.68% (before in the growth rate of Punjab was mainly attributed to closing down of state owned telecom giant company, PUNWIRE in 1998).The states of Karnataka and U.P. had growth rate of 0.37% & 5.41% respectively. The growth of communication equipment at the national level was found to be 6.82%, thus Punjab, Karnataka and UP achieved growth rates less than the national level and Haryana achieved growth rate higher than the national level.

Table 6.4 State-wise Growth Trend in Electronics Communications Industry

(Value in Rs. Million **)**

SN	States	1992	1993	1994	1995	1996	1997	1998	1999	CAGR(%)
1	**Karnataka**	8144.5	9667	8440	9506	5200	9110	7130	8360	
	- %Growth		18.69	-12.69	12.63	-45.3	75.19	-21.73	17.25	**0.37**
	- %Share	32.32	30.69	24.11	31.37	20	28.47	16.2	20.9	
2	**UP**	7641.2	10401.5	9450	10643.5	4780	6910	9580	11050	
	- %Growth		36.12	-9.15	12.63	-55.09	44.56	38.64	15.34	**5.41**
	- %Share	30.32	33.02	27	35.13	18.38	21.59	21.77	27.63	
3	**Punjab**	1276.8	1978.5	2840	3198.69	3470	3350	3430	1750	
	- %Growth		54.96	43.54	12.63	8.48	-3.46	2.39	-48.98	**4.60**
	- %Share	5.07	6.28	8.11	10.56	13.35	10.47	7.8	4.38	
4	**Haryana**	521.4	429	880.6	991.82	490	1550	2800	3870	
	- %Growth		-17.72	105.27	12.63	-50.6	216.33	80.65	38.21	**33.15**
	- %Share	2.07	1.36	2.52	3.27	1.88	4.84	6.36	9.68	
5	**India**	25200	31500	35000	30300	26000	32000	44000	40000	
	- %Growth		25	11.11	-13.43	-14.19	23.08	37.5	-9.09	**6.82**
	- %Share	22.27	24.19	22.67	17.42	13.38	14.82	17.74	14.41	

Source : Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

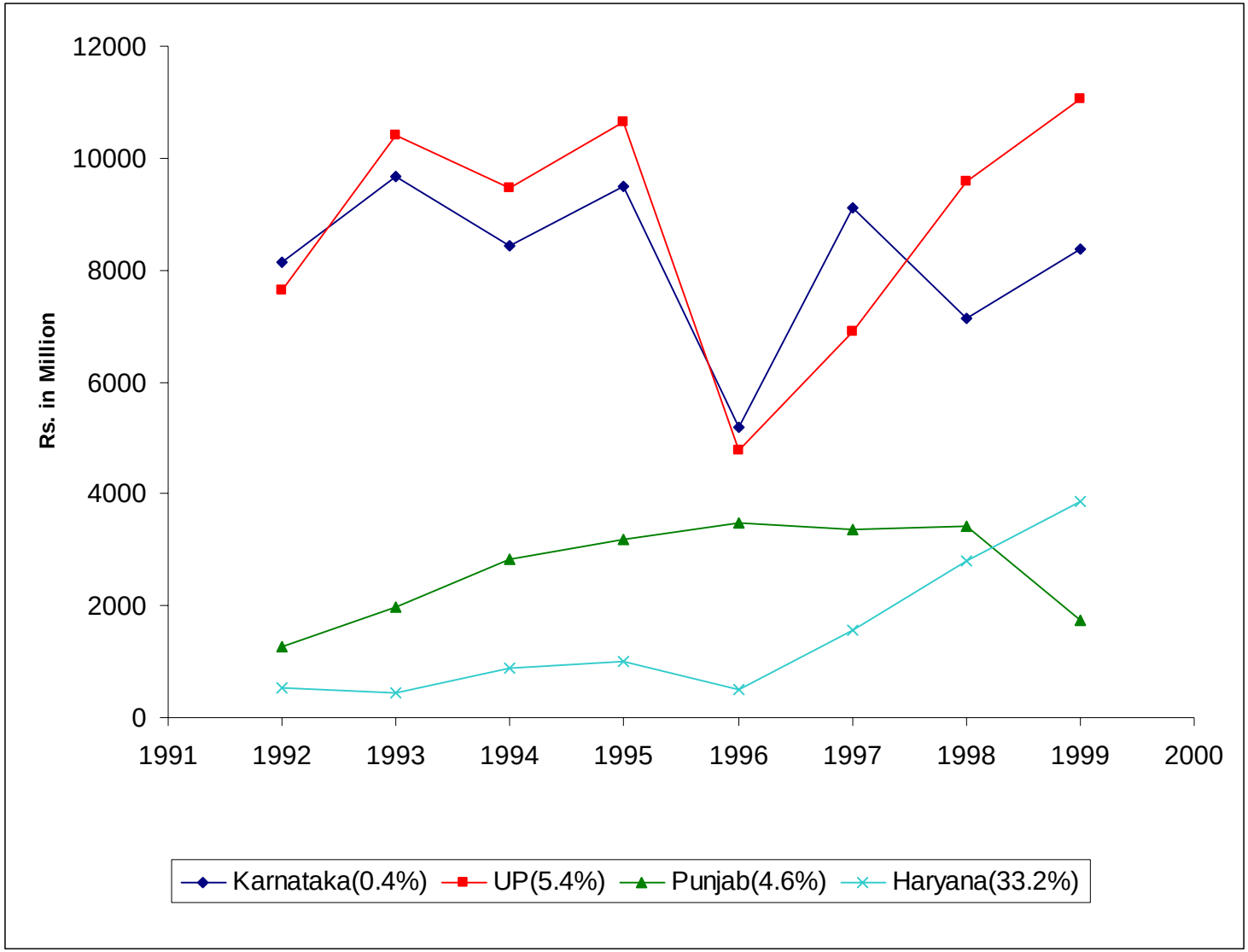


Figure 6.4 Growth Trend in Electronics Communication Production in the States.

6.2.2.4 Electronics Components

The sector-wise growth trend in electronics components industry is given in Table 6.5 and Figure 6.5. Punjab had the lowest growth rate of 6.9% during the period 1992-99, whereas as Haryana recorded a growth rate of 22.5% during the same period, the highest among the four states. As such, Punjab's share in national production fell from 8.4% in 1992 to 5.82% in 1999 and that of Haryana rose from 1.01% in 1992 to 1.82% in 1999.

During 1992-99, Karnataka and UP had growth rate of 9.2% and 11.7% respectively. The growth at the national level was observed to be of 12.6%. Punjab, Karnataka and UP had growth rates less than the national growth rate in this segment, whereas Haryana recorded a growth rate higher than the national level.

Demand of micro-electronic, opto-electronic devices, surface mount components and display devices has created a sizable market in India but due to availability of cheaper imported components, domestic manufacturing industry has been adversely affected.

Table 6.5 State-wise Growth Trend in Electronics Components Industry

(Value in Rs. Million **)**

SN	States	1992	1993	1994	1995	1996	1997	1998	1999	CAGR(%)
1	**Karnataka**	3759.1	4097	4770	5372.5	5950	7270	6740	6960	
	- %Growth		8.99	16.43	12.63	10.75	22.18	-7.29	3.26	**9.2**
	- %Share	16.97	16.26	15.74	15.57	16.53	17.39	14.49	13.65	
2	**UP**	4818.6	4831.1	6623.3	7459.8	7500	8570	10660	10450	
	- %Growth		0.26	37.1	12.63	0.54	14.27	24.39	-1.97	**11.7**
	- %Share	21.75	19.17	21.86	21.62	20.83	20.5	22.92	20.49	
3	**Punjab**	1861.6	2236	3300	3716.79	2300	4110	2350	2970	
	- %Growth		20.11	47.58	12.63	-38.12	78.7	-42.82	26.38	**6.9**
	- %Share	8.4	8.87	10.89	10.77	6.39	9.83	5.05	5.82	
4	**Haryana**	224.5	191	335	377.31	730	570	850	930	
	- %Growth		-14.92	75.39	12.63	93.47	-21.92	49.12	9.41	**22.5**
	- %Share	1.01	0.76	1.11	1.09	2.03	1.36	1.83	1.82	
5	**India**	22150	25200	30300	34500	36000	41800	46500	51000	
	- %Growth		13.77	20.24	13.86	4.35	16.11	11.24	9.68	**12.6**
	- %Share	19.58	19.35	19.62	19.84	18.53	19.36	18.75	18.38	

Source : Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

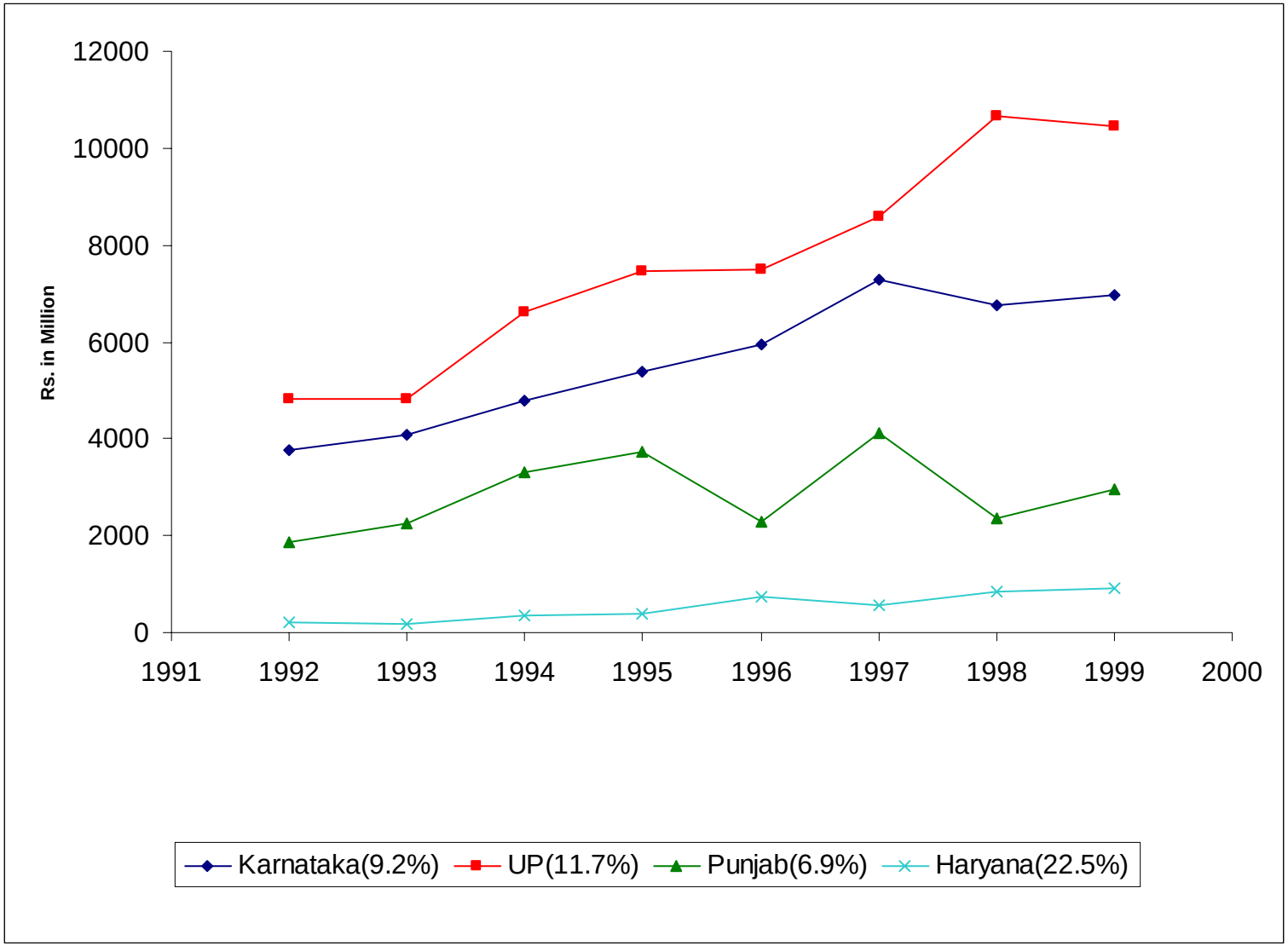


Figure 6.5 Growth Trend in Electronics Component Production in the States.

6.2.2.5 Computer Hardware

The sector-wise growth trend in computer hardware industry is given in Table 6.6 and Figure 6.6. Punjab had a negative growth rate of –9.06% during the period 1992-99, whereas Haryana achieved a growth rate of 28.61 during the same period, the highest among the four states. As such, Punjab's share in national production fell from 0.97% in 1992 to 0.24% in 1999 and that of Haryana rose from 0.42% in 1992 to 0.68% in 1999.

During 1992-99, the states of Karnataka and UP had growth rate of 12.03% and 20.86% respectively. The growth at national level was observed to be of 10.98%. Punjab had growth rate less than the national growth rate, whereas Haryana, Karnataka and UP achieved growth rates higher than the national level.

Table 6.6 State-wise Growth Trend in Computer Hardware Industry

(Value in Rs. Million **)**

SN	States	1992	1993	1994	1995	1996	1997	1998	1999	CAGR(%)
1	**Karnataka**	3082.1	3278	4190	4719.2	5990	7220	6400	6830	
	- %Growth		6.36	27.82	12.63	26.93	20.53	-11.36	6.72	**12.03**
	- %Share	25.58	24.43	23.61	23.42	23.96	26.74	29.09	27.32	
2	**UP**	1242.4	1373	2040	2297.7	3960	3970	5240	4680	
	- %Growth		10.51	48.58	12.63	72.35	0.25	31.99	-10.69	**20.86**
	- %Share	10.31	10.23	11.49	11.4	15.84	14.7	23.82	18.72	
3	**Punjab**	116.7	25	72.6	81.77	160	170	80	60	
	- %Growth		-78.58	190.4	12.63	95.67	6.25	-52.94	-25	**-9.06**
	- %Share	0.97	0.19	0.41	0.41	0.64	0.63	0.36	0.24	
4	**Haryana**	29.2	13	4.8	5.41	60	417	420	170	
	- %Growth		-55.48	-63.08	12.7	1009.06	595	0.72	-59.52	**28.61**
	- %Share	0.24	0.1	0.03	0.03	0.24	1.54	1.91	0.68	
5	**India**	12050	13420	17750	20150	25000	27000	22000	25000	
	- %Growth		11.37	32.27	13.52	24.07	8	-18.52	13.64	**10.98**
	- %Share	10.65	10.31	11.5	11.59	12.87	12.51	8.87	9.01	

Source : Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

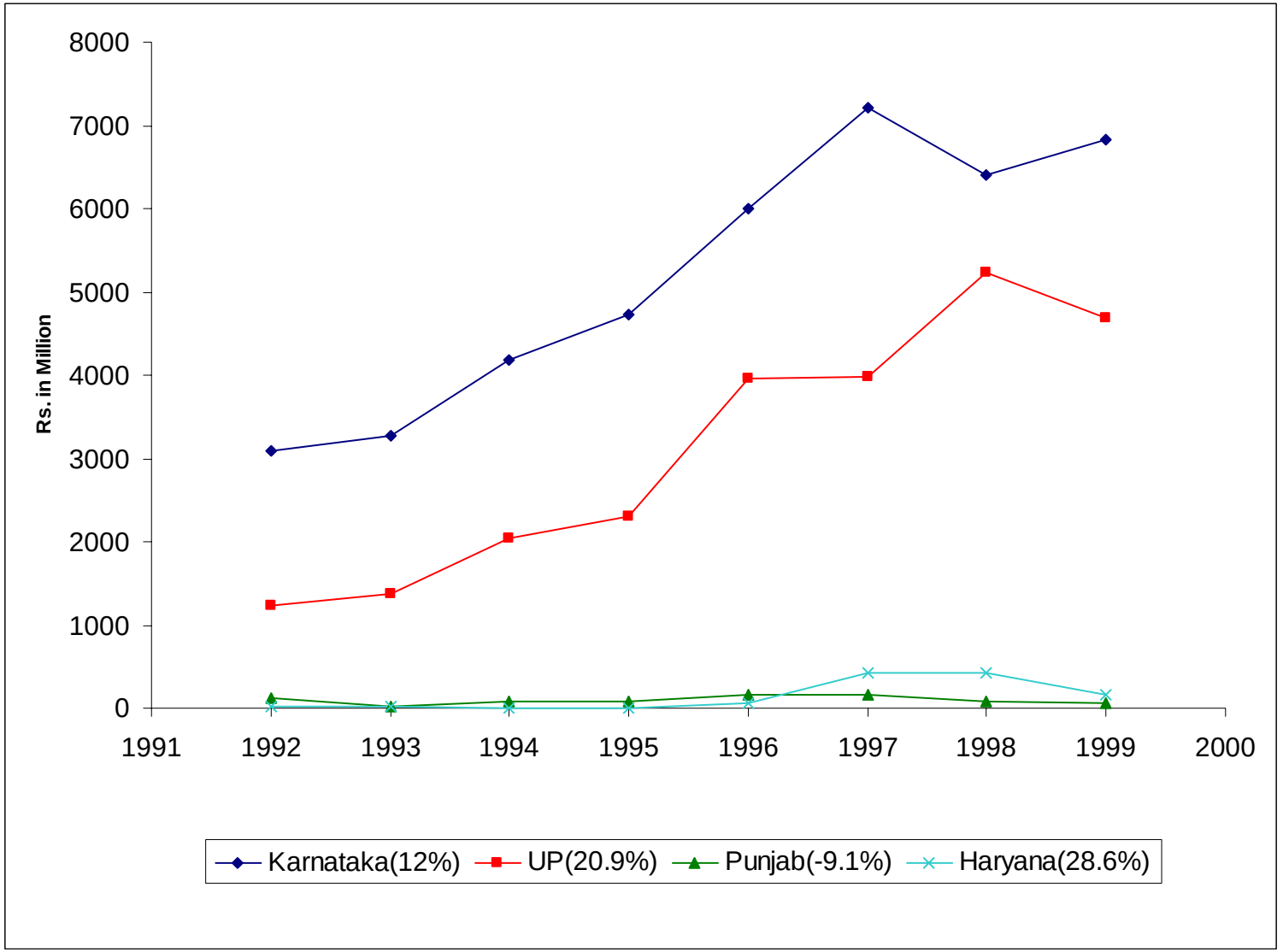


Figure 6.6 Growth Trend in Computer Hardware Industry in the States

6.2.2.6 Strategic Electronics

The sector-wise growth trend in strategic electronics industry is given in Table 6.7 and Figure 6.7 Punjab does note have any strategic electronic industry. During 1992-99 Haryana was able to build large capacity achieving a growth of 157.98% with its percentage share rising from 0.04% in 1992 to 8.14% in 1999. The states of Karnataka and UP continued to have higher volumes with a growth rate of 29.46% and 19.91% respectively.

At the national level growth rate in strategic electronic was observed to be 19.8%, thus all the three states i.e. Haryana, Karnataka and UP recorded higher growth rate than the national level.

Table 6.7 State-wise Growth Trend in Strategic Electronics Industry

(Value in Rs. Million **)**

S N	States	1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%)
1	**Karnataka**	803.7	1081.5	1970	2218.8	5800	1670	3840	4900	
	- %Growth		34.57	82.15	12.63	161.4	-71.21	129.94	27.6	**29.46**
	- %Share	20.09	30.21	32.83	28.63	48.33	17.84	30.24	35	
2	**UP**	897.3	970	1159.8	1306.3	1800	2220	3200	3200	
	- %Growth		8.1	19.57	12.63	37.93	23.33	44.14	0	**19.91**
	- %Share	22.43	27.09	19.33	16.86	15	23.72	25.2	22.86	
3	**Punjab**	-	-	-	-	-	-	-	-	-
	- %Growth	-	-	-	-	-	-	-	-	-
	- %Share	-	-	-	-	-	-	-	-	-
4	**Haryana**	1.5	2	2.3	2.59	1100	420	870	1140	
	- %Growth		33.33	15	12.61	42371.04	-61.82	107.14	31.03	**157.95**
	- %Share	0.04	0.06	0.04	0.03	9.17	4.49	6.85	8.14	
5	**India**	4000	3580	6000	7750	12000	9360	12700	14000	
	- %Growth		-10.5	67.6	29.17	54.84	-22	35.68	10.24	**19.6**
	- %Share	3.54	2.75	3.89	4.46	6.18	4.34	5.12	5.05	

Source: Production data related to states Data Bank and Information Division, DIT, Government of India and that of national production from Annual Report-96-97 and 2001-02 of DIT.

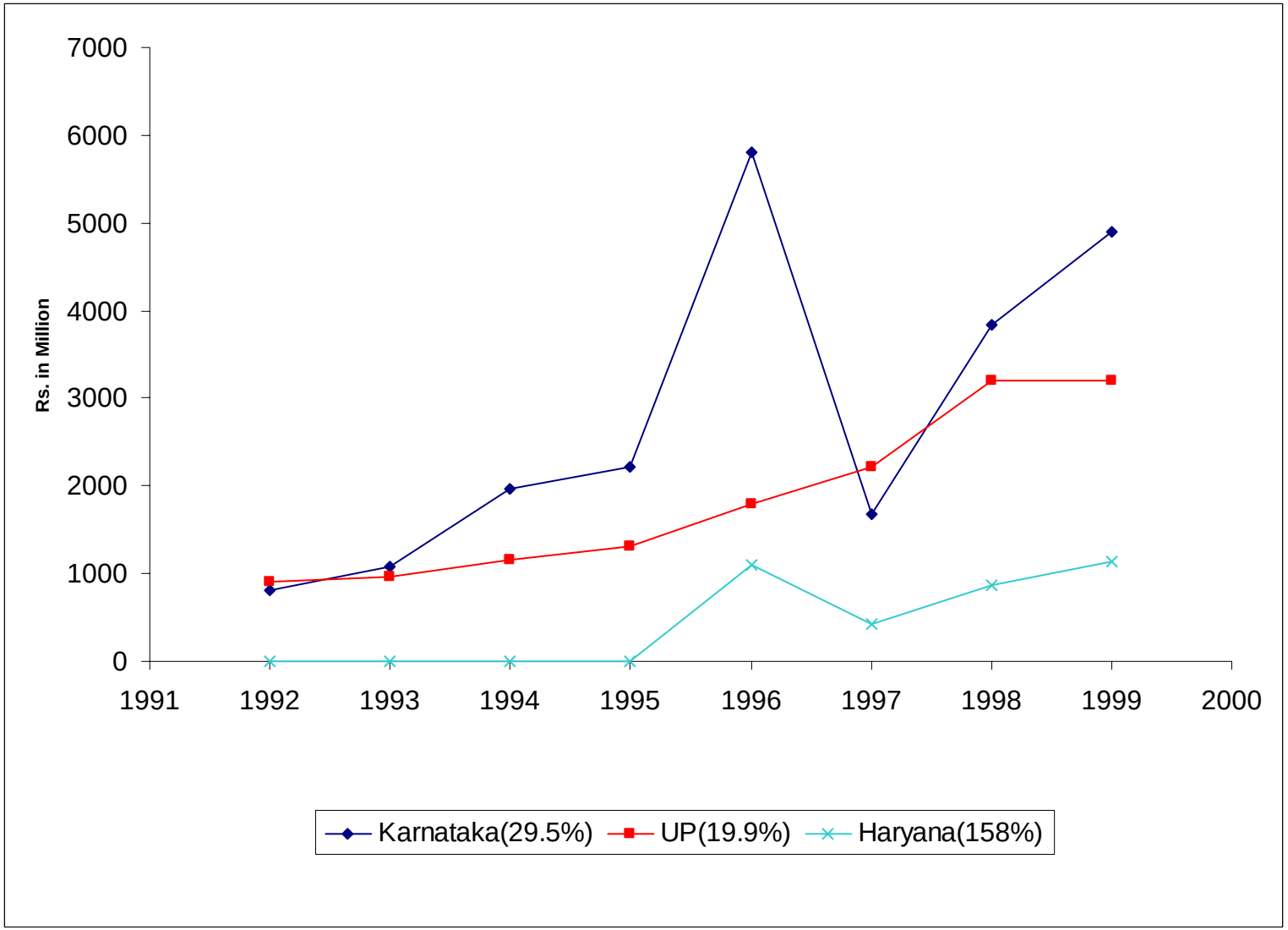


Figure 6.7 Growth Trend in Strategic Electronics Industry in the States

State Ranking

State Ranking on the basis of CAGR for the electronics sector is given in Table 6.8

Table 6.8 State Ranks on the basis of Sectoral Growth Rates

S. N.	State	Consumer Electronics	Industrial Electronics	Communication	Components	Computer Hardware	Strategic Electronics
1.	**Karnataka**	3	1	4	3	3	2
2.	**U.P.**	2	3	2	2	2	3
3.	**Punjab**	4	4	3	4	4	4
4.	**Haryana**	1	2	1	1	1	1

Punjab occupied lowest rank in all the segments among the four states except Electronics communication: In electronics communication Punjab was placed 3rd instead of 4th. Haryana performed better than Punjab in all sectors of electronics production. The production value for all sectors is higher in Karnataka & Uttar Pradesh than the two deficient states of Punjab and Haryana. Haryana achieved better production volumes in all segments of electronics industry than Punjab except in case of electronics components.

6.2.3 Performance in Electronics Hardware and Software Exports

Electronics Hardware Exports

During 2001-02, Punjab had a negligible contribution of 0.06% to the national electronics hardware exports while Haryana contributed a higher share of 1.23%. It was found that Karnataka contributed a share of 24.92% in the national electronics hardware exports and has occupied 2nd rank in India while UP shows much lower share of 5.42% and was placed at 4th rank. (Table 6.9). Data pertaining to state-wise electronics exports for the previous years was not available.

Table 6.9 State-wise Comparative Contribution in Electronics Exports During 2001-02

(Value in Rs. Million **)**

	National	Karnataka	U.P.	Haryana	Punjab
Exports	58000.0	14453.3	3140.5	710.8	35.2
Share (%)	-	24.92	5.42	1.23	0.06
Rank	-	2	4	9	13

Source : Statistical Year Book-2001-02 of ESC, Government of India.

Software Exports

Table 6.10 State-wise Growth Trend of Software Exports Industry

(Value in Rs. Million **)**

State	95-96	96-97	97-98	98-99	99-00	00-01	01-02	CAGR(%)
Punjab	0	0	0	80	150	500	700	-
-%Growth	-	-	-	-	87.5	233.33	40.0	**106.1**
-%Share	0	0	0	0.13	0.13	0.25	0.24	-
-Rank	-	-	-	13	13	13	13	-
-STPI Units	0	0	0	20	131	147	164	-
Haryana	260	600	1290	1800	4050	14500	21400	-
-%Growth	-	130.77	115.0	39.53	125.0	258.02	47.59	**108.6**
-%Share	3.59	3.37	3.77	2.86	3.49	7.23	7.25	-
-Rank	7	7	7	7	7	6	5	-
-STPI Units	16	39	41	27	104	129	161	-
Karnataka	3680	9110	16500	28880	43210	74750	99040	
-%Growth	-	147.55	81.11	75.03	49.62	72.99	32.49	**73.1**
-%Share	50.85	51.18	48.18	45.84	37.23	37.28	33.55	-
-Rank	1	1	1	1	1	1	1	-
-STPI Units	149	170	220	276	746	932	1033	-
UP	980	2150	3900	6740	12200	16600	20000	-
-%Growth	-	119.39	81.40	72.82	81.00	36.07	20.48	**65.3**
-%Share	13.54	12.08	11.39	10.7	10.51	8.28	6.77	-
-Rank	2	2	3	3	4	5	6	-
-STPI Units	31	18	22	59	193	236	264	-
India	7237	17800	34244	63000	116070	200510	295230	-
-%Growth	-	145.96	92.38	83.97	84.24	72.75	47.24	**85.5**
-STPI Units	521	667	844	1196	5582	6652	7202	-

Source : STPI, DIT, Government of India.

Note : Software export figures are related to export by STPI units only.

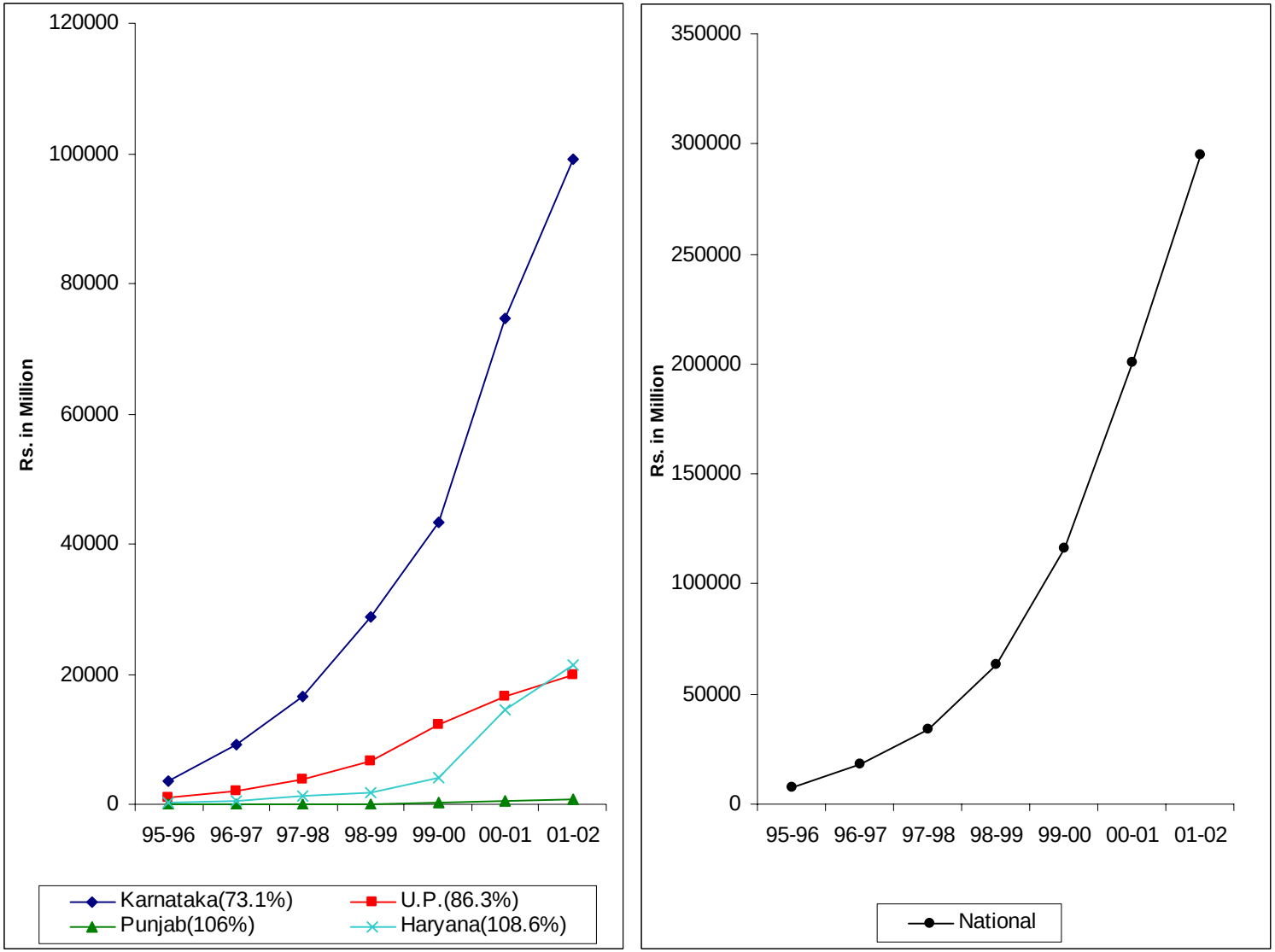
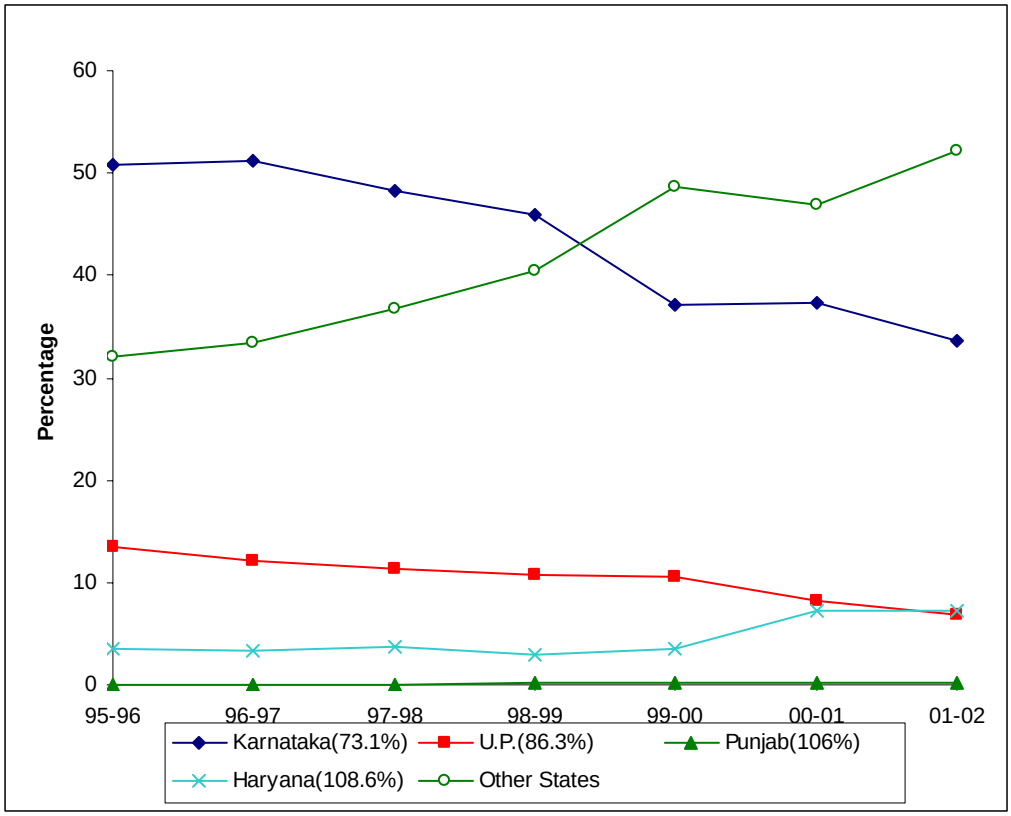


Figure 6.8 Growth of Software Exports from the States



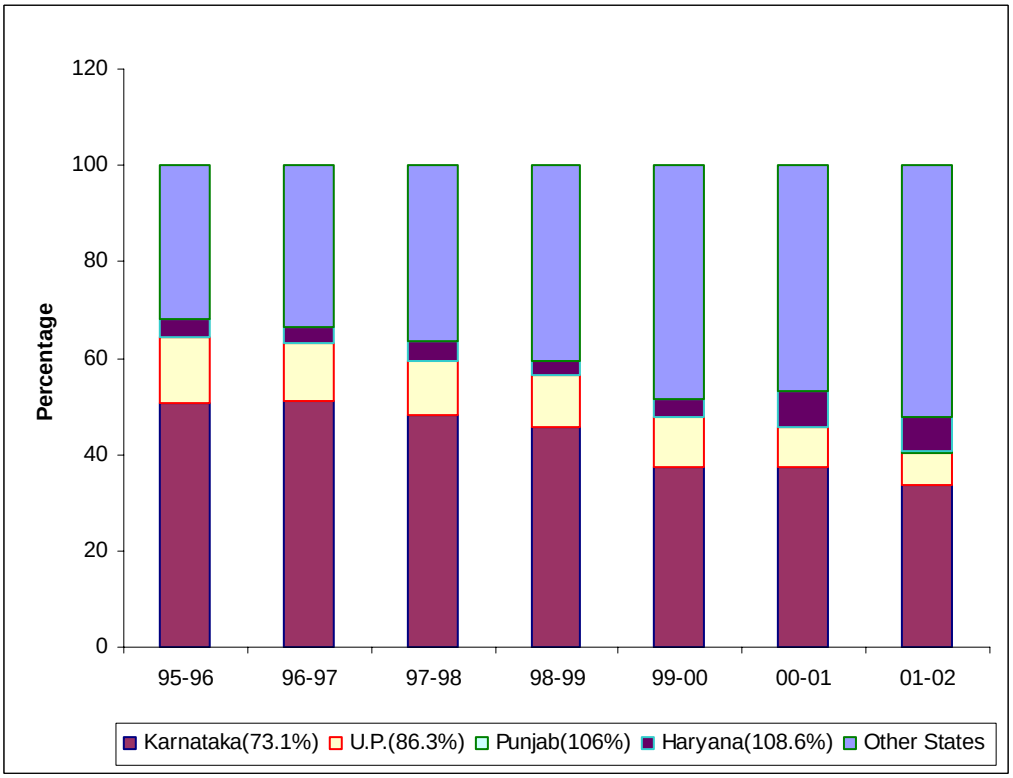


Figure 6.8-A Contribution of Various States in National Software Exports

The sector-wise growth trend in software exports industry is given in Table 6.10 and Figure 6.8 & Figure 6.8 - A. Punjab had a growth rate of 106.1% during 1995-96 to 2001-02 only. Infact the state had no exports till 1997-98 and no exports were made during the period 1998-99 to 2001-02. Haryana achieved a growth rate of 108.6% from 1995-96 to 2001-02.

During the period from 1995-96 to 2001-02 Karnataka and Uttar Pradesh had growth rates of 73.1% and 65.3% respectively. During the same period the growth at the national level was found to be 85.5%. Karnataka continued to maintain the 1st rank throughout the seven years period, UP came down from 2nd to 6th rank and Haryana went up from 7th to 5th rank during the same period. State-wise ranking on the basis of exports during 2001-02 for the four states of Punjab, Haryana, Karnataka and UP were 13, 5, 1 and 6 respectively.

One of the factors contributing to the increase in software exports and setting up of software exports units under STP scheme in 1999-00 was the change in national policy with respect to the withdrawal of exemption of corporate taxes of software exports for a period of ten years w.e.f. April, 2000.

Figure 6.9 shows a clear impact of change in national policies in regards to taxes (2000) on software exports from India and also from the states of Haryana and Karnataka. However, Punjab seems to have not encashed this opportunity. The graph also predicts that growth pattern of software exports in India is close to the pattern of growth in IT industry in the state of Karnataka. Table 6.10 shows a comparative growth rate in this sector in the four states.

It was observed that the growth pattern of software export in India is very close to the pattern of growth in IT industry in Karnataka. This may not be out of track to indicate here that growth in Karnataka represents growth in India as a whole.

6.2.4 Productivity and Employment Generation by Electronics and IT Industry in the States

Punjab had increased per employee production from Rs. 0.54 in 1992 to Rs. 0.63 in 1999, whereas Haryana achieved a higher increase from Rs. 0.27 in 1992 to Rs. 1.31 in 1999. As such, Punjab's employment increased from 7500 in 1992 to 9000 in 1999 and that of Haryana rose from 6000 in 1992 to 000 in 1999 (Table 6.11).

Table 6.11 State-wise Trend in Productivity of Electronics Industry

(Value in Rs.)

States		1992	1993	1994	1995	1996	1997	1998	1999	CAGR (%)
Punjab	Production Per Employee	0.54	0.67	0.93	1.01	0.85	0.95	0.77	0.63	**2.23**
	Production	4027	5187	7348	8112	7010	8080	6550	5680	5.04
	Employment	7500	7800	7900	8050	8200	8500	8500	9000	2.64
Haryana	Production Per Employee	0.27	0.24	0.34	0.39	0.54	0.95	0.96	1.31	**25.31**
	Production	1592	1498	2233	2515	3500	7637	8680	13130	35.17
	Employment	6000	6150	6500	6500	6500	8000	9000	10000	7.57
Karnataka	Production Per Employee	0.50	0.54	0.58	0.63	0.67	0.64	0.65	0.70	**4.92**
	Production	23040	25977	29070	32628	40320	41850	42730	47750	10.97
	Employment	46000	48000	50000	52083	60000	65000	66000	68000	5.74
Uttar Pradesh	Production Per Employee	0.51	0.61	0.67	0.65	0.53	0.70	0.96	1.06	**11.02**
	Production	21008	25381	28093	31647	29300	38740	54520	60350	16.27
	Employment	40950	41500	42000	48500	55000	55200	56500	57000	4.8
India	Production Per Employee	0.38	0.42	0.48	0.53	0.53	0.63	0.70	0.76	**10.41**
	Production	113150	130200	154400	173900	194300	215860	248000	277500	13.67
	Employment	300000	310000	320000	330000	370000	345000	355000	365000	2.84

Source: Data Bank and Information Division, DIT, Government of India. Production employment data related to 1995 is on average basis. Employment figures related to the year 2001 were not available.

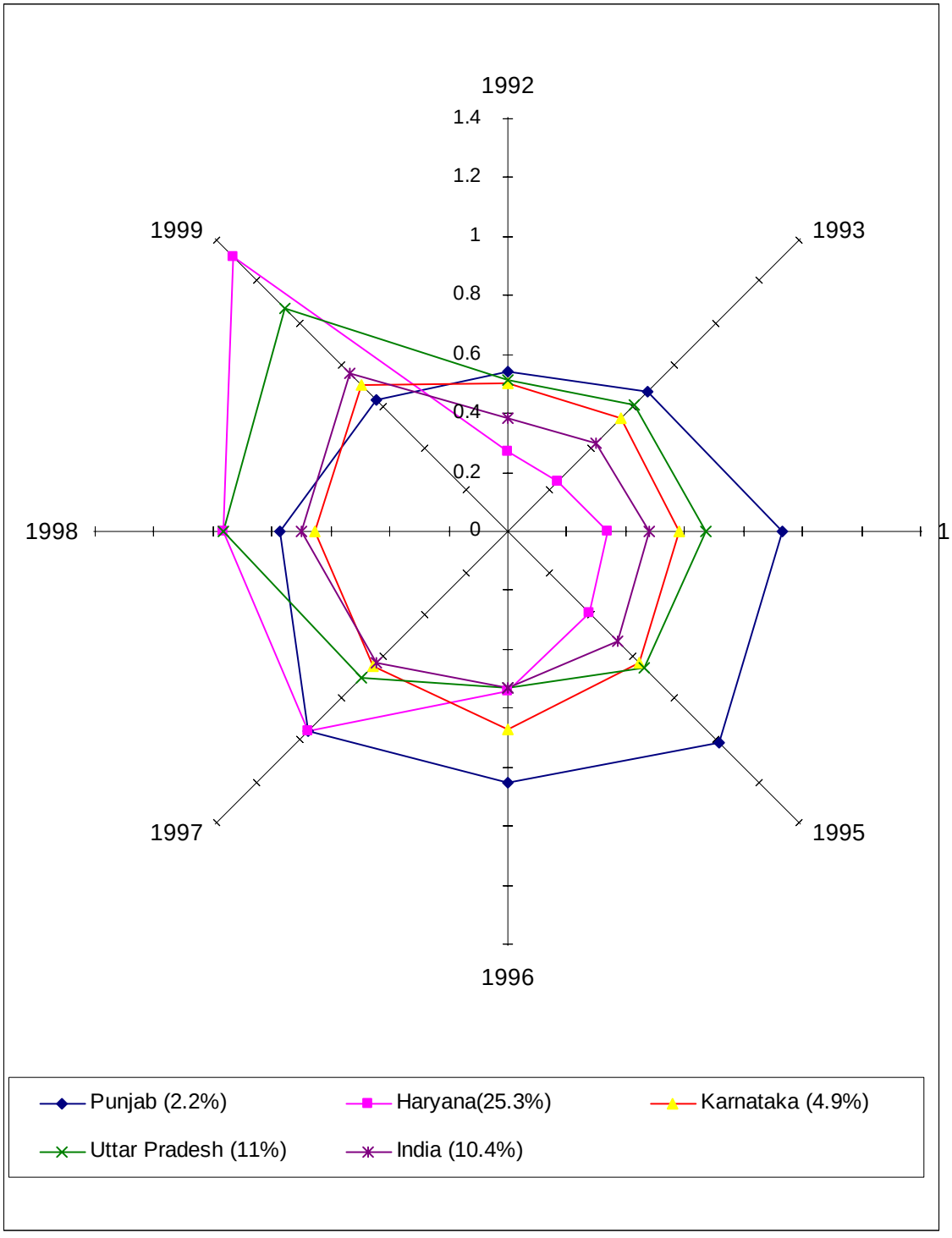


Figure 6.9 Trend in Productivity per Employee in Electronics Industry of the States

During 1992-99, Karnataka and UP had per employee production increased from Rs. 0.50 and Rs. 0.51 in 1992 respectively to Rs. 0.70 and Rs. 1.06 in 1999 respectively. Per employee production at national level was observed to have increased from Rs. 0.38 in 1992 to Rs. 0.76 in 1999. Punjab's productivity in electronics industry has grown at the rate of 2.23% during 1992-99, whereas Haryana achieved 25.31%, the highest in the four states during the same period which is much above the national level growth in productivity (10.41%). Growth in employment generation was also observed to be the highest in case of Haryana, whereas Punjab achieved the lowest growth of 2.64% during the same period (Figure 6.9).

During primary study, 4 of the eight electronics units from Noida, 2 out of the four from Mohali and 5 of the eight units from Gurgaon have considered competition with MNCs as a threat to electronics industry in India. Indian policies related to Liberalisation have both positive and negative impacts on the industry. It has put a great pressure on Indian industry to improve efficiency and productivity to withstand global competition resulting in improvements in quality of Indian products which was not considered as that important in the past, it has brought technology advancement in the sector which experience a fast obsolescence and more important is that it has opened up greater opportunities for taking advantage of a much larger market.

Further, the electronic units, as well as the experts from electronics industry suggested that ancillarisation is an essential tool for development of small scale industry in the state which provide maximum employment opportunities and thus contribute in building up a specific skill base required by the electronics and IT industry as one of the important factor for its success. In addition, ancillarisation also result in cost and quality benefits to the end product. The need is to identify mother units especially in consumer electronics, which can provide design inputs and help lift quality products for domestic and export market. Such industry shall also have a parallel replacement market thus helping small-scale units to market some of their produce directly. Some of the products that can be considered for ancillarisation may include TVs, TV tuners, audio/videos equipments, mobile phones, etc. Efforts should be made to identify items in all sectors of electronics industry, which are adaptable to ancillarisation.

6.3 CONCLUSIONS

The inferences drawn in this Chapter are presented through Table 6.12 and Table 6.13.

Table 6.12 Sectoral Growth Analysis of Electronics Production During the Period 1992-99.

State	Consumer Electronics	Industrial Electronics	Communication	Components	Computer Hardware	Strategic Electronics	TotalElectronics hardware	Software Exports	Productivity
Karnataka	14.29 (3)	**18.63 (1)**	**0.37 (4)**	9.2 (3)	12.03 (3)	29.46 (2)	8.4 (3)	**73.1 (4)**	4.92 (3)
U.P.	30.90 (2)	10.29 (3)	5.41 (2)	11.7 (2)	20.86 (2)	19.91 (3)	12.44 (2)	86.3 (3)	11.02 (2)
Punjab	**6.38 (4)**	**-3.15 (4)**	4.60 (3)	**6.9 (4)**	**-9.06 (4)**	**- (4)**	**3.89 (4)**	106@ (2)	**2.23 (4)**
Haryana	**57.02 (1)**	12.66 (2)	**33.15 (1)**	**22.5 (1)**	**28.61 (1)**	**157.95 (1)**	**26.42 (1)**	**108.6 (1)**	**25.31 (1)**
India	18.46	12.78	6.82	12.6	10.98	19.6	10.48	85.6	10.41

Note : -

- Growth is indicated in percentage and ranking is given in brackets.
- Growth is based on 1992-99 period except in case of software exports, which is based on 1995-96 to 2001-02.
- Productivity has been defined as per employee production in electronics industry.
- @ There was no software exports from Punjab during first 3 years i.e. 1995-96, 1996-97 and 1997-98 and growth is calculated only during 1998-99 to 2001-02 period, whereas growth is based on 1995-96 to 2001-02 in respect of other states.
- Figures in **RED** colour indicates highest growth, whereas **GREEN** colour figures indicate lowest growth.

In terms of production volume (Rupee Value) the production of electronics hardware in Karnataka and Uttar Pradesh is higher of the two deficient states. From Table 6.12, it is evident that Punjab has the lowest growth rate in all segments of electronics production. The rate of growth was found to be less than the national growth in all the segments of electronics industry. Haryana on the other side had impressive growth in all segments. It is

not only higher than Punjab but higher of all the four states. Its growth is highest in five out of six segments i.e. consumer electronics, communications, components, computer hardware, strategic electronic and software export and even in Industrial electronic segment; it is near the national growth rate. Thus, it can be said that Punjab has legged behind over 1992-99, whereas Haryana has prosperous in respect of electronics and IT industry.

The production value for all sections is higher in Karnataka & Uttar Pradesh than the two deficient states of Punjab and Haryana. The sectoral production in millions of Rupees for the year 1999 is given in Table 6.13

It was hypothesized that the growth and development of electronics industry in Karnataka and Uttar Pradesh is better than the growth and development of electronics industry in Punjab and Haryana. However, the results explored that Haryana had impressive growth in all segments. It is not only higher than Punjab but higher of all the four states. Thus, hypothesis stands rejected.

Table 6.13 Sectoral Electronics Production in Rs. Million for the Year 1999 in the States of Punjab and Haryana

(Value in Rs. Million)

S. N.	State	Consumer Electronics	Industrial Electronics	Communi cation	Compo nents	Computer Hardware	Strategic Electronics	Total Electronic hardware	Software * Exports
3.	Punjab	760	140	1750	2970	60	0	5680	700
4.	Haryana	5700	1320	3870	930	170	1140	13130	21400

* Software exports figure related to year 2001-02

Table 6.13 above shows the volume of electronics production of different segments in respect of the deficient states during the year 1999. Haryana achieved higher volumes in all sectors except in case of electronics components.

It was found during the primary study [see para 5.4.7(6)] that ancillarisation should be developed in both the states of Punjab and Haryana to boost the small-scale sector of electronics and IT industry. This will in turn, generate maximum employment opportunities in the respective states.

CHAPTER - 7

CONCLUSIONS AND RECOMMENDATIONS

The worldwide electronics scenario has undergone a transformation in the last two decades. It has now acquired the status of an all-pervasive industry because of its varied applications in the capital and consumer markets. The electronics provides a forceful leverage to the socio-economic and technological development of human society. Electronics has significantly influenced the cost structure, quality and productivity standards of most other Industries. The impact of technological innovations has reduced costs and increased equipment performance resulting in exponentially increasing demand. This has led to veritable explosion of new products and processes. The chip technology that has revolutionized the industry is on its way towards a total or near total substitution of conventional electro-mechanical products and processes. Indian IT industry has made its unique place in software development at world level.

The onset of the liberalization process in the country and the consequent greater linkages with the global economy in most sectors of industry including electronics have posed several challenges for the state electronics development corporations, both for their operational as well as promotional roles. These challenges have materialized in the form of opportunities to be exploited and threats to be countered.

The states of Punjab and Haryana initiated their efforts toward development of electronics industry around the same time when the states of Karnataka and U.P. had made their entry. During 1994, Karnataka and U.P. contributed 19.71% and 18.28% respectively in the national electronic production and were among the top two in the country in this sector while the states of Punjab and Haryana were way behind with a negligible contribution of only 4.7% and 1.51% respectively. During the same year, northern states together contributed 37% to the national electronics production and these low contributing states are otherwise most prosperous states in this part of the

country. These facts reflected enough scope for conducting a comprehensive and systematic study to find out reasons for a very low growth of this industry in the states of Punjab and Haryana and to conclude findings and make recommendations for better growth of this industry in these two states.

The following are the major objectives of the present study:

1. To Study the government policies and to know the present level of growth and development of electronics and IT industry in India.
2. To compare state policies, initiatives and growth and development of this industry in the states of Punjab, Haryana, Karnataka and Uttar Pradesh (U.P.).
3. To suggest suitable strategies for development of electronics and IT industry in the states of Punjab and Haryana.

As the study was more macro-analytical, all past and present quantitative and qualitative information was collected and analysis is based on primary as well as secondary data. The sample for the primary study was comprised of all the 277 electronic manufacturing and 96 software export companies registered as ‘Limited’ and ‘Private Limited’ companies and in operation atleast for a year at the time of collection of data and 7 experts from Electronics and IT industry in two of the high growth states of Karnataka and U.P. and low growth states of Punjab and Haryana. It has been found that Electronic and IT industry in India is mainly located in specific regions in a state. The study, therefore, is confined to locations in the four cities of Mohali (Punjab), Gurgaon (Haryana), Bangalore (Karnataka) and Noida (U.P.). Experts include professionals from electronics manufacturing and Software export units, SEDCs and STPI. Selection of the sample was purposive and based on the judgment. Four separate pre-tested questionnaires were designed for collection of data. The time series data was duly classified for the proposed period. Simple statistical techniques involving use of scatter line diagram, histogram, simple and compound growth rate and wherever required fitting of curve were used for drawing inferences.

CONCLUSIONS AND RECOMMENDATIONS

7.1 NATIONAL LEVEL INDUSTRY IN CONTEXT WITH THE GLOBAL SCENARIO

One of the objectives of the study was:

> *"To know the present level of growth and development of Electronics and IT industry in India in the context of developments in the industry world over and to study the past and present government policies for development of Electronic and IT industry in India*".

7.1.1 India's Performance vis-à-vis World Electronics Industry

During the period 1995-96 to 2000-01 world electronics production grew at a compound annual growth rate (CAGR) of 7.1% whereas electronics industry in India achieved a growth rate of 4.3% registering a fall in India's share in world electronics production from 0.55% in 1995-96 to 0.48% in 2000-01 (growth in share recorded as –2.7%). However, in software production, India achieved a tremendous growth of 46.3% as against the world's CAGR recorded at 15.5%.

7.1. 2 Sector-wise Performance of Indian vis-à-vis World Electronics Industry

The sector-wise analysis of electronics industry revealed that during the period 1998-2001, the Indian consumer electronics, electronic components, industrial electronics, computer hardware and electronics communication achieved a growth rate of 8.16%, 8.04%, 7.56%, 5.01% and -1.83% respectively. The corresponding growth rate for the world's production was recorded as 6.0%, 15.25%, 4.09%, 9.25% and 8.83% respectively. Thus, India achieved a higher growth rate in consumer electronics and Industrial electronics than the world's level of production while in all other sectors that included electronics components, computer hardware and electronics communication India recorded a much lower growth rate than the world level.

Indian electronics communication industry registered a negative growth rate of –1.83% during the period.

7.1.3 Sector-wise Performance of Indian Electronics Industry: Domestic and Export

The sector-wise analysis of production and exports for the period 2001-02 in Indian industry revealed that all segments of industry had a growth rate in exports greater than that of production except in case of consumer electronics where incidentally both are equal at 15.9%, implying that India was able to export a higher proportion of production vis-à-vis domestic consumption in all segments except consumer electronics.

7.1.4 Sector-wise Potential of Indian Electronics Industry on the basis of its Performance during the last Ten Years (1992- 93 to 2001- 02)

On the basis of analysis of Indian Electronics industry's i) sector-wise growth in production; ii) volumes of production and exports in rupees; iii) ratio of exports to production in percentage in the year 2001-02, and iv) compound annual growth rate achieved by various segments of Electronics industry of world production, following inferences were drawn with regard to level of demand and potential of various segments of electronics industry in India.

a) Consumer electronics has high domestic demand as compared to export potential.
b) Industrial electronics has a high export potential.
c) Computer hardware has a high domestic and exports potential.
d) Electronics communication has intense competition, high domestic and low export potential.
e) Strategic electronics has high domestic demand and low exports potential.
f) Electronics component industry has high domestic demand and high export potential.
g) Computer software has high potential both in domestic as well as export market.

7.1.5 Targets vis-à-vis Actual Performance of Electronics Industry in India during the last two Five Year Plans.

The analysis revealed that the actual production and growth of electronics has been much below the targets during the VIII (1992-93 to 1996-97) and IX (1997-98 to 2001-02) plans. The percentage of fulfillment of targets shows a consistent downward trend as the plan years go by. This is reflected clearly for both the plans. This trend may be attributed to:

a) Obvious forecasting limitation of difficulty in forecasting the distant future,
b) The time lag in change in policies and the actual situation due to unpredictable events and changes in the national and international scene.

7.1.6 Quality Improvements in Software Development

The analysis revealed that as in February'2003, 46 out of 69 SEI CMM Level 5 certified companies worldwide were located in India. This shows that more and more Indian software organizations are taking concrete steps to enhance their process capabilities. Thus, preparing them to face global competition. The benefits of the SIE-CMM include better control of products and processes, lower effort and schedule overruns and better project risk management leading to lower costs and high customer satisfaction.

7.1.7 Major Weaknesses Hindering Development of Electronics and IT Industry in India

The study found that following are the major weaknesses hindering development of electronics and IT Industry in India:

- Small fragmented production units.
- High cost of capital.
- Lack of capital intensive high tech R&D facilities.
- Bureaucratic delays in decision making.
- Inverted duty structure (promotes gray market).
- Non-availability of components, semi-conductors and other chips in domestic market as these are largely being imported.

7.1.8 Performance of STPI Scheme

The performance of STPI units achieved a growth of 99.9% during the period 1993-94 to 2001-2002. This also is an indicator of success of STPI scheme of Government of India.

7.1.9 EXIM Policy

The outstanding performance in exports by some of the sectors in electronics and software (IT) industry can be attributed to liberal industrial & EXIM policies of Govt. of India announced especially in 1990-91 & 1999-2000.

7.1.10 Future Targets for 2008 in Software Production

The targets set by National IT Task Force especially for software production and exports for the year 2008 are likely to be exceeded if the CAGR achieved over the last 10 years is maintained during the remaining period.

As per Global competitiveness report prepared by World Economic Forum, India has achieved a growth competitiveness ranking of 59 in the year 2000, 57 in 2001 and 48 in 2002.

COMMENTS

a) Strategies for Promoting Electronics and I.T. Industry

India has only 0.48% share in world's electronics production. The domestic and export potential given at section 7.1.4 is based on the performance of the industry in the last 10 years i.e. 1992-93 to 2001-02. Therefore, there needs to be strategic changes to improve performance of this industry. The various aspects to be considered for the strategic planning vis-à-vis the characteristics of Electronics and IT Industry are given in the following table.

S. N.	Basic Characteristics of Electronics and IT Industry	Requirements	Action on Part of the State and its Nodal Agencies
1.	Fast pace of technological changes	Skill, R&D	-Highly educated and trained manpower. -Indigenous development of new technology and processes
2.	Highly capital intensive-core processes and technologies	High investment, R&D	-Indigenous development of new technologies and processes. -Participation of large corporate and multinationals. Identification of products and processes suitable for ancillarisation.
3.	Declining Cost	Appropriate relatively stable products and processes; Innovative and creative manpower	-Identification of relatively stable products and processes. -Highly educated and trained manpower.
4.	Global Reach	Service; Quality; Speed; Cost effectiveness; Marketing skills	-Emphasis on Quality consciousness/improvement. -Faster and reliable means of transport and communication -Right selection of markets. -Customer Relationship Management skills.
5.	Independent of location	Good city life; Efficient transportation and communication facility; No red-tapism; Importance of Hotels, Airports etc.	-High dispersion and concentration of industry. -Highly supportive environment in state departments and agencies.
6	Low gestation period in large number of electronics/IT product line/items	Easy to implement and move (shift); Less Red-tapism;	-Highly supportive state agencies. -Policies conducive to attracting investments in the state. -Less Red-tapism.

Thus, long-term policy of the state must concentrate on development of highly educated skilled manpower; indigenous development of technology and processes; identifying relatively stable cost effective products and processes, preferably amenable to small innovations and ancillarisation and providing an appropriate and conducive environment for electronics industry with efficient communication and transportation facilities. The state should show high commitment, an investor friendly supportive attitude for attracting entrepreneurs/corporate in this industry.

b) Rationalization of Duty Structure

The growth rate of exports in electronics and IT industry in India was found to be higher than the growth rate of production in all segments of Industry. One of the reasons could be favourable Export-Import policy of the country with regard to 100% exports oriented units. The policy has achieved the intended purpose and has given boost to exports. However, some experts during the study suggested that duty structure should be rationalized in electronics industry to encourage investment in domestic electronics component industry. It is recommended that duty structure should be graded lowest for raw materials, a little higher for components, still higher for kits and highest for finished equipments. This strategy shall encourage domestic manufacturing and prove competitive in cost to imports. Also the experience of total manufacturing shall lead to better innovations and reduction in overall cost of production. Duty differentials should be worked so as to increase both domestic demand and export potential

c) Potential for Development of Packaged Software

Indian software companies have established themselves in international market as very good software service providers. Package and product share in total software exports was found to be only 11%. It is recommended that to sustain India's high growth rate in software exports, India should prove itself as good software product providers. To encourage software package development, government should announce some incentives for the units engaged in software package development.

7.2 STATE LEVEL INDUSTRY

The other objective of the study was:

"*To compare state policies, initiatives and growth and development of Electronics and IT industry in the states of Punjab, Haryana, Karnataka and U.P., and to suggest suitable strategies for development of electronics and IT industry in the states of Punjab and Haryana".*

7.2.1 Major Weaknesses Hindering Development of Electronics and IT Industry in Punjab and Haryana

Results from the Qualitative as well as Quantitative study revealed that following are the major weaknesses hindering development of Electronics and I.T. Industry in Punjab and Haryana. Strategy recommended to overcome these weaknesses and to boost development of Electronics and I.T. Industry for the states of Punjab and Haryana is explained in Para no. 7.2.2 in this chapter.

7.2.1.1 Punjab State

Common for both Electronics and I.T. Industry

- Political uncertainty.
- Frequent power cuts and breakdowns.
- Lack of effective implementation of IT and Electronics policy on ground level.
- Absence of regional approach in development of Industry in Mohali-Chandigarh-Panchkula-Baddi region.
- Lack of regular interaction between government and Industry.
- Failure of Single Window concept
- Lack of continuity and technical orientation in the state Electronics /IT Development agencies.
- Poor public transport facility in Industrial complexes
- Non-availability of luxury Hotels.
- Banks insisting on collateral security.

- Long processing time by Financial Institutions.
- Lack of effective Customer Relationship Management

Electronics Industry

- Low volumes of production by electronics industry.
- Non existence of Ancillarisation.
- Failure of EHTP scheme.
- Lack of in-house R&D culture in electronic Units.
- Lack of capital intensive hi-tech R&D facilities.
- Higher cost of raw materials

I.T. Industry

- Failure of Virtual Organization concept due to women not allowed to work beyond 10 PM
- Non availability of ready to move Incubation facilities for IT.
- Non-availability of International airport
- Non-availability of experienced manpower at the level of project leaders

7.2.1.2 Haryana State

Common for both Electronics and I.T. Industry

- Political uncertainty.
- Frequent power cuts and breakdowns.
- Absence of regional approach in development of Industry in Mohali-Chandigarh-Panchkula-Baddi region.
- Lack of regular interaction between government and Industry.
- Failure of Single Window concept
- Banks insisting on collateral security.
- Long processing time by Financial Institutions.

Electronics Industry

- Low volumes of production by electronics industry.
- Lack of proper growth of Ancillarisation.
- Higher cost of raw materials

I.T. Industry

- Failure of Virtual Organization concept due to women not allowed to work beyond 10 PM

7.2.2 Strategy for the States of Punjab and Haryana

From the present study, it is evident that Punjab has the lowest growth rate in all segments of electronics production. The rate of growth was found to be less than the national growth in all the segments of electronics industry. Haryana on the other side had impressive growth in all segments. It is not only higher than Punjab but also higher of all the four states. Its growth is highest in five out of six segments i.e. consumer electronics, communications, components, computer hardware, strategic electronic and software export and even in Industrial electronic segment it is near the national growth rate. Thus, it can be said that Punjab has performed poorly during 1992-99, whereas Haryana has prospered in all segments of electronics and IT industry. During 1999 Haryana achieved higher volumes than Punjab in all sectors except in case of electronics components.

In view of above findings, it is suggested that Haryana should make efforts to sustain its present growth in electronics and IT sector whereas Punjab needs to develop strategies that give enough impetus to industry till it becomes self-sustaining.

7.2.2.1 POLICIES (State Electronics and IT Policies)

1. Reliable and Quality Power Supply

Frequent power cuts and poor quality of power supply was the common difficulty being faced by atleast 55% units. It was observed that this has substantial adding to their cost due to expenses on maintaining generators. To

sort out power crises in the state, the government is suggested to take concrete steps to find alternate sources of power generation and also to identify energy saving means. One of the energy saving means is extensive use of CFL for which it is suggested that to encourage manufacture and use of CFL, the state should either subsidies production of CFL on line with Kerala or may itself be a major buyer to stimulate demand of the product.

2. Short-term and Long-term policies

Experts from electronics industry suggested that Punjab state government should take measures to save existing sick units as its short-term policy and promote services sector where manpower availability finds an advantage. IT enabled services should be identified as the focus industry. As a long-term policy, the state should consolidate to make larger viable units and enter international market with a large competitive base of technical manpower in services sector.

3. Virtual Organization Concept and Three Shift working for Men and Women

It was revealed from the study that Indian companies export 70-80% software to USA. It is night in USA when day in India and therefore, a twenty-four hour virtual office is possible for Indian software exporters doing business with USA. It is suggested that the state policy should provide industry friendly environment and flexibilities in labour laws to allow three shift working for all men and women so that twenty four hour virtual office concept for Indian software exporters become a reality.

4. Need for Effective Implementation of State IT and Electronics Policy

The results of the present study show that incentives play a marginal role if an entrepreneur could start his industry six month earlier than the present system. He will earn more than the incentives in financial terms. Therefore, the

experts suggested that effective implementation of the policy is more important. It has been noticed that in Punjab, various complaints from industry are pending with the authorities where the industry has been refused for exemption from octroi (sort of entry tax) by the local government officials at entry barriers even when the same has been allowed under the state IT Policy. This clearly shows that the policy has not been effectively implemented on ground.

5. Growth Areas Need to be Focussed

It was revealed from the present study that both the states particularly Punjab should identify following as focus industry and take appropriate measures to promote this industry:

- IT enabled services Industry (Call centre, BPO etc.)
- Packaged Software Development
- LSI/VLSI Design and Production
- e-Governance, e-Commerce and e-Business
- E-education and e-learning
- Graphic Intelligence based Script Technology
- R&D in the new Emerging Technologies
- Electro-medical Equipments
- Electronic Components
- Bio-technology
- Bio-informatics
- Pharma-informatics
-

6. Regional Approach for Development of Mohali-Chandigarh-Panchkula-Baddi Region

Findings of the present study revealed that the four states of Punjab, Chandigarh, Haryana and Himachal Pradesh should make joint efforts with regional approach for the development of Electronics and IT industry in the Mohali-Chandigarh-Panchkula-Baddi region instead of individual efforts. Past studies had also supported that instead of a state wise, isolated approach to industrial development, a collaborative, interdependent approach for the region

as a whole should be put into place. To achieve this, the four states should jointly workout a region based 'IT and Electronics Policy' for development of this segment of Industry in Mohali(Punjab), Chandigarh, Panchkula (Haryana) and Baddi (Himachal Pradesh) region.

7. Strategy for Ancilarisation

It was revealed during the primary study that Ancillarisation should be developed in both the states of Punjab and Haryana to boost the small-scale sector of electronics and IT industry. This will in turn, generate maximum employment opportunities in the respective states. The need is to identify mother units especially in consumer electronics, which can provide design inputs and help lift quality products for domestic and export market. Such industry shall also have a parallel replacement market thus helping small-scale units to market some of their produce directly. Some of the products that can be considered for ancillarisation may include TVs, TV tuners, audio/videos equipments, mobile phones, etc. Efforts should be made to identify items in all sectors of electronics industry, which are adaptable to ancillarisation.

8. **Higher Cost of Raw Material**

To overcome the problem of higher cost of raw material for domestic electronic manufacturers, duty structure should be rationalized in electronics industry which will encourage investment in domestic electronics component industry. It is recommended that duty structure should be graded lowest for raw materials, a little higher for components, still higher for kits and highest for finished equipments. This strategy shall encourage domestic manufacturing and prove competitive in cost to imports and hence lower cost of raw material to the domestic manufacturers.

7.2.2.2 INSTITUTIONAL SUPPORT (Facilitation role by the Government**)**

1. Role of States as a Facilitator for Promotion of Electronics and IT Industry

It was observed that electronics Companies like PBEML, PEOSL, PPPL, Zimag and Intermagnetics promoted by PSEDPCL and PUNWIRE & ESPL of PSIDC have closed down their operations or diversified its product line other

than their main activity of electronics manufacturing just to sustain its existence, than to contribute to the economy. It is recommended that the state should play the role of the facilitator, than that of a producer. Dahlman, Carl J. (1990) in his study has supported the idea of states playing the role of a facilitator only.

2. Frequent Interaction with Industry

Electronics and software units (63%) from the four states suggested that SEDC should interact with industry more frequently and the agencies need to make aware the industry about the kind of support they can give to them. It is recommended that to have effective interaction with the electronics and IT industry, SEDC should organize Industry meet under the chairmanship of the Chief Minister of the respective state once in every six months, identify their problems and initiate appropriate time bound actions to resolve them.

3. Annual Awards for the Best Performer Unit

Twenty four percent of the electronic and software units from the sample states suggested to encourage best performers, by constituting an award “Best Software/Electronics Unit of the Year” to be awarded annually to best of two units from each of the Electronics and Software segment.

4. Revival / Growth of Existing Electronic Manufacturing Units

The study found that small and medium electronics manufacturing industry is in bad shape in both the states of Punjab and Haryana. States need to take effective steps for their revival / growth. Ancillarisation and a special financial package for such units could be the solution.

5. Professional Approach by State Agencies

The study revealed that both the states of Punjab and Haryana should take effective steps to remove red tapism and corruption at all levels, simplify

procedures and switch over from bureaucratic to professional working in government agencies.

6. Single Window Services

During the study it was established that software exporters are facing abnormal delays in customs clearances and therefore, it is suggested that customs related problems of software exporters should be handled directly by jurisdictional STPI center under its single window concept.

7. Role of Government, Academic and Research Institutions in Development of Industry

The study also revealed that a state level Advisory Board comprising of high profile professionals from private electronics and IT industries and academic /research institutions should be formed to advise the government on improvements in the electronics and IT sector in the states. The board should meet on regular basis at least once in six months period.

7.2.2.3 INFRASTRUCTURAL FACILITIES

1. Development of Incubation Facilities

The present study revealed that Incubation facilities and IT Parks to provide Plug-and-Play facilities to IT export units have been set up by all the states under study except Punjab. Therefore, it is suggested that IT Parks one each at Mohali, Ludhiana and Jalandhur should be set up through private joint venture partner having previous expertise of setting up and selling such facility.

2. Establishment of Independent Development Authorities for Mohali and Gurgaon

Mohali and Gurgaon are important Electronics / I.T. hubs for the respective states. Therefore, keeping in mind requirement for next 20 years

period, development of high quality basic infrastructure and services of international standards, ahead of the demand is needed to be created at these locations. This needs concentrated efforts by the states in the two towns for which establishment of separate ‘Mohali Development Authority’ by Punjab and ‘Gurgaon Development Authority’ by Haryana are suggested.

3. EHTP Facilities

The study also revealed that Electronics Hardware Technology Parks to house electronics hardware exporters have been established by all the states under study except Punjab. It is suggested that Punjab should set up such facilities at Mohali and Ludhiana to encourage electronics hardware exports from the state.

4. Establishment of Special Economic Zones

The present study found that tax benefits to software exporters under STP scheme of government of India is available only up-to 31-3-2010. This may not only affect further growth of Software Industry in these states but it would also be difficult to retain the existing software exporters. Therefore, to enable the IT companies to enjoy tax benefits for another 20 years, both the states of Punjab and Haryana should establish SEZ facilities.

5. International Air Connectivity

International air connectivity was found by the present study to be one of the essential requirements of the software export industry and therefore suggested that Punjab should initiate efforts along with Chandigarh to get existing airport at Chandigarh to be declared as an International Airport.

6. Social Infrastructure

a) Transportation facility from residential locations to the industrial centers was found to be poor in all the four sample locations except Noida

(UP), which enjoy the facilities, provided by Delhi Transport Corporation. Public transport facility should be made effective from different residential locations to Industrial hubs in the cities of Gurgaon and Mohali by the respective state governments.

b) The present study also revealed that social infrastructure like big hotels, clubs/pubs, golf course, lake etc. were found to be adequate in all the four locations except that big hotels are not available in Mohali /Chandigarh. State government of Punjab should promote big hotels in Mohali, Ludhiana and Jalandhar. The state should also promote five star hotels in Chandigarh jointly with Chandigarh government.

7.2.2.4 TECHNOLOGY (R&D Facilities for Electronics and IT Industry)

1. Development of VLSI Technology

During the primary study, it was found that Semiconductor Complex Ltd. (SCL), a central PSU has established facilities in the area of chip manufacturing in Mohali and have recently initiated training facilities in the area of VLSI design. It is suggested that the state government of Punjab should initiate a National Institute of VLSI Design (NIVD) in joint collaboration with SCL and a private partner to conduct both M.Tech level and short duration specialized training courses and research in the field of VLSI design. In the joint venture, SCL will provide technology and its lab facilities, private JV partner will invest major share of funds and Punjab Infotech to provide land and facilitation services.

2. Quality Improvement

a) The study revealed that out of the 46 SEI CMM Level-5 certified companies located in India 20 were located in Bangalore, 5 in Delhi region and not a single in Punjab. It is suggested that both the states of Punjab and Haryana should give appropriate incentives to

software units for acquiring SEI CMM Level certifications or comparable quality certifications by International agencies.

b) During the study, it was found that the perception about Indian products in international market was that the products were of inferior quality and IT units consider Indian software units also lacked in commitments. The states are suggested to take measures that include making quality certification by the electronics and IT units mandatory to avail state's fiscal incentives.

3. Maintaining a Database of Available Sources of Technology

Industry in support of past studies suggested that Government should create and maintain a database on the sources of technology available for transfer to the electronic / I.T. units from within and outside India.

4. Motivation for Creating In-house R&D Facilities

The study revealed that some motivation need to be introduced to encourage in-house R&D culture in the electronics and I.T. Industry of Punjab and Haryana for which a special technology incentive for creating in-house R&D facilities which may be exempting expenses on R&D efforts from Income tax is recommended.

5. Setting-up of Technology Centres of Excellence

During the study, the industry as well as experts emphasized on creating technology centers of excellence where research and engineering of emerging technologies can be funded by state govt. and industry jointly.

7.2.2.5 HUMAN RESOURCE DEVELOPMENT

1. In-house Training of Employees to Upgrade Skills

The present study revealed that to resolve shortage of skill base, both the states should encourage in-house training of employees by the companies for

which it is suggested that expenses incurred on in-house training to update knowledge and skills of its people should be exempted from income tax with a suitable ceiling fixed.

2. Maintaining a Database of Available Skill Base

The industry suggested maintaining a database of available manpower skilled in various specialized areas of electronics and software in the state. It is suggested that SEDC of the states should prepare and maintain such a database and a nominal fee can be charged to the units availing this facility so that the efforts are based on no-loss-no-profit basis.

3. Developing Skill Base Required for ITES Industry

Considering a good scope of IT enables services industry in India in next 1-2 years time, It came out during the study that to explore this business avenue, a State Institute of IT Enabled Services (SIITES) be set up in Gurgaon and Mohali/Chandigarh by the respective states in collaboration with a private sector leading IT unit(s). Branches /Extension centers of the state level Institutes are suggested to be opened in Ludhiana, Patiala, Jalandhar, Bhathinda and Amritsar in Punjab and Hisar, Rohtak, Karnal and Ambala in Haryana.

4. Information Technology as Part of Curriculum of Technical Courses

To keep pace with the growing requirement of IT trained manpower, the study found that the states should introduce atleast one subject dedicated to I.T. in all graduate level courses in different fields.

5. Industrial Training as Part of Curriculum of Technical Courses

The research suggested that Industrial training of 4-8 weeks period during summer vacations after 2nd year onwards in all technical and management courses should be mandatory for degree to be awarded.

6. Creation of Advisory Board for Improvement in the Sector

The study also revealed that a state level Advisory Board comprising of high profile professionals from private electronics and IT industries and academic /research institutions should be formed by the State Technical Education Boards of both Punjab and Haryana to advise the government on improvements in the education system in the field of electronics and IT sector in the states. The board should meet on regular basis atleast once in six months period.

7.2.2.6 FINANCE

1. Venture Capital Fund

It is recommended that Haryana state should also set up venture capital funds in the state for providing financial support to the IT companies. To make the scheme effective, both the states of Punjab and Haryana need to workout some mechanism for fast track clearance of cases for sanction and disbursement of funds.

2. Creation of Electronics Development Fund

During primary study it was found that 33 of the total sample units considered existing rate of interest on finance as very high as compared to international interest rates. To resolve problem of higher cost of finance, a State Electronics Development Fund (SEDF) is suggested to be formed to subsidize the interest rate to the level of international rates both for term loan and working capital for small and medium electronics manufacturing Industry.

3. Simplification of Financing Terms For the Investors

It is also suggested that low debt equity ratio of 2:1 should be changed to 4:1 for electronics and IT manufacturing industry in the initial years which can

progressively be reduced to 2:1 or even 1:1 as many of these industries enjoy high margins and need only initial support.

7.2.2.7 MARKETING

1. More Allocation of Foreign Exchange and Collaborative Marketing Efforts by Industry

Cost of export marketing to USA and Europe was considered to be very costly. To resolve this problem, it is suggested that one, more allocation of foreign exchange to software exporters for marketing abroad and two, creation of a federation of software companies on cost sharing basis for members exporting through it.

2. Effective Customer Relationship Management to Ensure Repeat Business Orders

During the present study, it was found that many IT companies have problems of repeat business orders from their customers. To resolve this problem, it is suggested that software export units should practices a strong Customer Relationship Management to retain existing customers.

3. Strategy to Overcome Problem of Small Production Volumes

Experts from electronics industry suggested following steps to overcome problem of small volumes of production in Indian electronics industry:

- Through acquisition and mergers as small units can not survive,
- Letting unviable units die out or merge,
- Privatization of PSUs,
- Relaxation of labor laws to permit hire and fire
- Penetrate in rural market.

7.3 AREAS FOR FURTHER RESEARCH

In the present study an effort was made to evaluate the state government policies and initiatives, and other factors such as Institutional support, Infrastructural facilities, Technology, Human Resource Development, Finance and Marketing for the growth of Electronics and IT industry in Karnataka and Uttar Pradesh as high growth states and Punjab and Haryana as low growth states and to recommend and suggest a strategy for a better growth of this industry in the deficient states. For further research other states can also be considered.

The focus of the present study was mainly on Electronics manufacturing and software export industry. Areas like domestic software industry, Telecom service industry and IT consultancy need to be addressed in further investigations. Attention of investigators is required to take up further research in the area of emerging technologies in Electronics and IT sector. This will help this segment of Industry in their expansion plans and diversifications within broader sector of Electronics, Telecommunication and Information Technology. China and Philippines are emerging as new destination for off-shore development of software which will be a threat to India's software export Industry. A study can be conducted by the investigators on this issue to workout a strategy for India how to face this challenge.

7.4 CONTRIBUTIONS TO KNOWLEDGE

Researchers in the past had identified gaps in the existing knowledge area concerning development of electronics and IT Industry. It is envisaged that by identifying and filling these gaps, the present spate of weaknesses hindering development of electronics and IT Industry in India reported in the literature could be ameliorated. This section highlights some of the gaps identified in this study, and the extent to which the findings could bridge them, hence contributing to the existing body of knowledge on the subject.

7.4.1 Strategy to Overcome Problem of Small Production Volumes

Indian electronics industry has been urged to focus on increasing production volumes to bring down cost to make prices of its products

competitive, as a strategy for surviving the stiff competitions engendered by ever-increasing globalisation (DoE, 1985;Alum, Ghayhr and Dieter Ernst, 1990;Seshagiri, 1975). The present study has suggested following steps to overcome problem of small volumes of production in Indian electronics industry:

a) Through acquisition and mergers as small units can not survive.
b) Letting unviable units die out or merge.
c) Penetrate in rural market.
d) Privatization of PSUs.
e) Relaxation of labor laws to permit hire and fire.

7.4.2 Creation of Electronics Development Fund

It has been severally argued that there is an urgent need to bring down cost of finance for the Industry particularly small scale electronics manufacturing (DoE, 1985;Nambiar, 1985). During the study, a high rate of interest on finance, banks insisting on collateral security for raising finance and abnormal delays in processing of their finance applications causing delay in implementation of the project and hence addition in cost were identified as serious financial problems by the Electronics Industry. The present investigation has suggested that to rescue small and medium scale electronics Industry from these problems, a dedicated State Electronics Development Fund (SEDF) in each of the state need to be formed and emphasized subsidizing the interest rate to the level of international rates both for term loan and working capital.

7.4.3 Rationalization of Duty Structure

Prevailing duty structure makes it unviable to invest in component manufacturing in India and that lack of low growth in electronic industry was due to failure of component industry was being pointed out in past (Nambiar,1985). During this study, electronic units (64.3%) suggested that import tariff structure should be such that it encourages investment in domestic component industry. The growth rate of exports in electronics and IT industry in India was found to be higher than the growth rate of production in all segments of Industry.

Present study has suggested that duty structure should be rationalized in electronics industry to encourage investment in domestic electronics component industry and recommended that duty structure should be graded lowest for raw materials, a little higher for components, still higher for kits and highest for finished equipments. This strategy shall encourage domestic manufacturing and prove competitive in cost to imports. Also the experience of total manufacturing shall lead to better innovations and reduction in overall cost of production. Duty differentials should be worked so as to increase both domestic demand and export potential

7.4.4 Need for effective Implementation of State Policies

A government policy on paper is of no use unless it is timely and effectively implemented on ground**.** This study found that incentives play a marginal role if an entrepreneur could start his industry six month earlier than the present system. The enterprise will earn more than the incentives in financial terms. Therefore, the present study has stressed on a need for time bound effective Implementation of the State Policies. For its effective implementation on ground, notifications by all the concerned departments /agencies of the state must be issued along with the notification of the policy by the state government.

7.4.5 Potential for Development of Packaged Software

Indian software companies were urged for creating of original technology and development of products and packages (Dewang Mehta, 2000). The present study has recommended that to sustain India's high growth rate in software exports, India should prove itself as good software product providers and urged the government to encourage software package development and announce some incentives for the units engaged in software package business.

7.4.6 Effective Customer Relationship Management to Ensure Repeat Business Orders

The present study has suggested the software export industry to practices an effective CRM (Customer Relationship Management) technique to retain existing customers and ensure repeat business from them.

7.4.7 Information Technology as Part of Curriculum of Technical Courses

To keep pace with the growing requirement of IT trained manpower, the study suggested a strategy to the states to introduce atleast one subject dedicated to I.T. in all graduate level courses in all fields: Arts, Commerce and Science.

Implementing the findings and recommendations of this study could revolutionize the development of electronics and IT industry in the states.

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ANNEXURE – I

QUESTIONNAIRE FOR ELECTRONICS INDUSTRY

(Contains six parts with 50 questions)

PART – I (General)

1. Name of the Company _____
2. Address: Head Office_____
   Factory / Works _____
   Telephone _____
   Fax _____

3. Date of incorporation: _____

4. Date of start of commercial production:_____

5. Paid up capital of the company:_____

6. Please state the form of your company (tick the right choice).
   a) Proprietorship _____ e) 100% E.O.U. _____
   b) Partnership _____ f) Other (specify) _____
   c) Private Ltd _____ _____ _____
   d) Limited Company _____

7. Which of the following category of Electronic Industry do you belong. Please tick the right choice.
   a) Consumer _____ e) Office Eqpt & Computer _____
   b) Component _____ f) Electronics Materials _____
   c) Communication _____ g) Electronics Allied _____
   d) Defence Electronics _____

8. Please State your item of manufacture _____
   Is it an import substitute? **Y/N**

9. State whether your company is
   a) 100% E.O.U. _____ d) Engaged in doing job work _____
   b) Ancillary Unit _____ e) Other, please specify _____
   c) OEM _____

10. Have you ever had a dealing with the following agencies? **If yes,** kindly indicate nature of services you got from them and how useful you found these services.

Agencies	**Nature of Services**	**Quality of Services (Excellent / Goods / Poor)**
State Deptt. Of Ind.	_____	_____
	_____	_____
State Indl. Dev. Corp.	_____	_____
	_____	_____
State Elect.Dev.Corp.	_____	_____
	_____	_____
State Finance Corp.	_____	_____
	_____	_____
Central Deptt. Of Electronics	_____	_____
	_____	_____

11. Indicate specific area of services in which you found it difficult to get assistance from Govt. Agency.

Specific service	**Govt. Agency involved**	**Difficulty**
a) _____	_____	_____
b) _____	_____	_____
c) _____	_____	_____
d) _____	_____	_____

12. Please indicate capacity utilization of your Company at various stages.(Tick the right choice)

	At start	Mar'1992	Mar'1994	Mar'1996	Mar'1998
a) Upto 50%	_____	_____	_____	_____	_____
b) 51% to 75%	_____	_____	_____	_____	_____
c) Above 75%	_____	_____	_____	_____	_____

13. If utilization is less than the target then tick mark the reason(s):

	At start	Mar'1992	Mar'1994	Mar'1996	Mar'1998
a) RM Problem	_____	_____	_____	_____	_____
b) Labour & Employment	_____	_____	_____	_____	_____
c) Lack of demand	_____	_____	_____	_____	_____
d) Any other,					
_____	_____	_____	_____	_____	_____

==========

PART – II Raw Material (RM)

14. Does your company import RM ? **Y/N**

If yes, please indicate.

	Name of Items Imported	%age of total input RM	Country
a)	_____	_____	_____
b)	_____	_____	_____
c)	_____	_____	_____

15. a) Is there any RM, whose supply / distribution is undertaken through a Govt. agency? **Y/N**

b) If yes, please State the name of such Govt. agency. How do you rate the overall services provided by such Govt. agency (**Excellent / Very Good/ Good / Fair/Poor)**

Name of Agency	Rating
_____	_____
_____	_____
_____	_____

c) Suggest how it can be improved

_____

_____

_____

==========

PART- III (Finance)

16. Please indicate the cost structure of your unit (in %age value of total cost)

	93-94	94-95	95-96	96-97	97-98
a) Cost if fixed assets (e.g. Land, Bldg., Machines, Furnitures etc.	_____	_____	_____	_____	_____
b) Variable cost (e.g. RM, Wages, Repair of machines, Transports)	_____	_____	_____	_____	_____

17. Please indicate your major source of Finance giving ratings **(Excellent / Goods / Satisfactory / Poor)** for services provided by the agency.

Source	Quality of Services	Source	Quality of Services
a) Commercial Bank	_____	f) SIDBI	_____
b) State Financial Corp.	_____	g) Own Funds	_____
c) State Indl Dev. Corp.	_____	h) Others, please specify	
d) IDBI	_____	_____	_____
e) IFCI	_____	_____	_____

18. a) Please specify the problem you have faced in financing your business
   i) _____
   ii) _____
   iii) _____

   b) Suggest measures for their improvement in the same order.

   i) _____
   ii) _____
   iii) _____

19. Please indicate performance of your company for the following years.

Year	Turnover	Profit / Loss
93-94	_____	_____
94-95	_____	_____
95-96	_____	_____
96-97	_____	_____
97-98	_____	_____

PART – IV (Marketng)

20. a) Are you an ancillary to a large manufacturer. **Y / N**
   b) **If yes**, do you supply to other customers as well? **Y / N**
   If yes, What %age in value of the total sales relates to other customers.

   ---

21. Please specify your sales (in Rs. Lacs)

	93-94	94-95	95-96	96-97	97-98
a) Domestic	_____	_____	_____	_____	_____
b) Exports	_____	_____	_____	_____	_____

22. What is the domestic marketing strategy of our Company? Please tick the right choice.
   a) Direct Selling _____
   b) Through distributors/ dealers _____
   c) Promoting through advertising/publicity _____
   d) Through Govt. Agency (like state nodal Agency
   Please specify name of Agency) _____
   _____ _____
   e) Other, please specify _____ _____
   _____ _____
   _____ _____

23. What is the export market strategy of your Company? Please tick mark the right choice.
   a) Through branch office abroad _____
   b) Through Govt. Agency _____
   c) Through attending international conferences/exhibitions _____
   d) Through broaker _____
   e) Others, please specify _____ _____
   _____

24. a) Please specify your domestic market problems

i) _____

ii) _____

iii) _____

b) Suggest measures for improvement in the same problems

i) _____

ii) _____

iii) _____

25. a) What is your perception of Indian products in International market?

_____

_____

_____

b) Suggestions, if any improve it

_____

_____

_____

26. What should be done to promote local industries. State in order of preference giving rating from 1 to 4.

	Preference (Ranking)
a) Change in Govt. policies	_____
b) Improve Quality of products	_____
c) Financial Soundness	_____
d) Cut down of prices	_____
e) Any other, please suggest	_____

_____

==========

PART – V (Labour)

27. Please indicate number of workers employed in your unit

At start	**92-93**	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**
a) 1-20						
b) 21-50						
c) 51-100						
d) 101-200						
e) 201-500						
f)500-1000						
g)above 1000						

28. Please indicate number of workers leaving jobs.

	Number of Workers		**Number of Workers**
a) Within one years	_____	c) Within 5 years	_____
b) within 2 years	_____	d) Within 10 years	_____

29. Indicate the causes of job changes giving rating from 1 to 7.

	Rating		**Rating**
a) For higher wages	_____	e) For better technical environment	_____
b) Job security	_____	f) Closure of unit	_____
c) Lack of job satisfaction	_____	g) Any other, please specify	_____
d) For better working conditions	_____	_____	_____

30. Total number of persons employed

	Supervisory			Non – supervisory		
	Tech. Deg.	Dip.	Non-Tech.	Tech. Deg.	Dip.	Non-Tech.
1993-94	_____	_____	_____	_____	_____	_____
1994-95	_____	_____	_____	_____	_____	_____
1995-96	_____	_____	_____	_____	_____	_____
1996-97	_____	_____	_____	_____	_____	_____
1997-98	_____	_____	_____	_____	_____	_____

31. a) Please state the problems which you face in the employment of skilled labour

_____

_____

_____

b) Type of skills required _____

_____

c) Suggest how to improve availability of skilled manpower

_____

_____

_____

32. What system of wage payment do you undertake? Please tick the right choice

a) Piece Rate based wages _____

b) Fixed wages _____

==========

PART – VI (Technology)

33. a) Does the training facilities are adequately available locally? **Y / N**

b) **If not,** suggest measures need to be taken.

---

34. Tick mark the right choice in regards to Technology used in your company,

a) Indigenous _____

b) Foreign _____

35. If Foreign Technology is used,

Does indigenous technology is also available? **Y / N**

If yes, what is the reason for opting Foreign technology

---

36. Do you use specialized infrastructural Govt. facilities? **Y / N**

If yes, please state which facilities are used. Tick the right choice.

	Adequate	Inadequate
i) Precision tooling facility	_____	_____
ii) Testing equipment facility	_____	_____
iii) Others, place specify		
_____	_____	_____
_____	_____	_____

37. In your view what are the various factors which contribute to the better growth of the electronics Industry. State whether available adequately in your state.

Factors	**Adequately Available**	**Inadequate**
a)_____	_____	_____
b)_____	_____	_____
c)_____	_____	_____
d)_____	_____	_____
e)_____	_____	_____

38. Please give suggestions how above factors can be improved (**Answer serialwise)**

a)_____

b)_____

c)_____

d)_____

e)_____

39. What changes or improvements you will advocate in the Industrial & fiscal policies of the Govt?

a)_____

b)_____

c)_____

d)_____

40. What are the factors which affect growth of Electronic Industry.
Please state in order of preference giving ranking from 1 to 7.

	Ranking
a) Political uncertainty	_____
b) Govt. Policies	_____
c) Govt. Incentives	_____
d) Availability of infrastructure facilities	_____
e) Funding procedures	_____
f) Technological innovations	_____
g) Any other, please specify_____	_____
_____	_____

41. a) Do you consider Govt. policies & efforts in the promotion of electronic Industry are adequate? **Y/N**
b) **If not,** please give suggestions to improve

i)_____

ii)_____

iii)_____

iv)_____

42. What are the high growth factors (strengths) of your company?

a)_____

b)_____

c)_____

d)_____

43. Is your Company located in an electronics estate? **Y /N**

44. Whether inhouse R&D facility exists in your company? **Y /N**

45. What are the low growth factors (weaknesses) of your company.

a)_____

b)_____

c)_____

d)_____

46. State level Electronics Corporations have been set up for promotion and development of electronics in their respective states.
a) Do you think your state Electronics Corporations has been successful in its objectives? **Y/N**
b) What steps do you suggest this corporation should take up to bring improvements?
i)_____
ii)_____
iii)_____
iv)_____

47. Do you think incentives already being provided to Electronics Industry by the State in which your unit is located are adequate? (Tick the right choice). **If No,** please suggest change required.

Incentives	**YES**	**NO**	**Changes Suggested**
a) Sales Tax	____	____	_____
b) Professional Tax	____	____	_____
c) Land Subsidy	____	____	_____
d) Octroi	____	____	_____
e) R&D assistance	____	____	_____
f) Feasibility Study assistance	____	____	_____
g) Others, please specify			
_____	____	____	_____
_____	____	____	_____

48. Please suggest additional incentives (in addition to those mentioned in question 47) which will help in further growth of electronic industry.
a)_____
b)_____
c)_____
d)_____

49. Any other suggestions not covered above for the better growth of the Electronics Industry of your State
a)_____
b)_____
c)_____
d)_____
e)_____

50. Particulars of the person who have filled up this form
Name_____ Designation _____

Signature_____ Date _____ Place _____

ANNEXURE - II

QUESTINNAIRE FOR SOFTWARE INDUSTRY

(contains 48 questions)

1. Name of the Company _____
2. Address : Head Office _____
   Factory / Works _____
   Telephone _____
   Fax _____

3. Date of incorporation : _____
4. Date of start of commercial production:_____
5. Paid up capital of the company: _____

6. Please state the form of your company (tick the right choice).
   a) Proprietorship _____ e) 100% E.O.U. _____
   b) Partnership _____ f) Other (specify)
   _____
   c) Private Ltd _____ _____
   d) Limited Company_____
7. State whether your company is
   a) STP Unit _____
   b) Non STP Unit _____

8. Please indicate your experties
   a)
   _____
   b)
   _____
   c)
   _____
   d)
   _____
   e)
   _____

9. Have you ever had a dealing with the following agencies? **If yes,** kindly indicate nature of services you got from them and how useful you found these services.

Agencies	**Nature of Services**	**Quality of Services (Excellent / Goods / Poor)**
State Deptt. Of Ind.	_____	_____
	_____	_____
State Indl. Dev. Corp.	_____	_____
	_____	_____
State Elect.Dev.Corp.	_____	_____
	_____	_____
State Finance Corp.	_____	_____
	_____	_____
Central Deptt. Of Electronics	_____	_____
STPI	_____	_____

10. Indicate specific area of services in which you found it difficult to get assistance from Govt. Agency.

Specific service	**Govt. Agency involved**	**Difficulty**
a) _____	_____	_____
b) _____	_____	_____
c) _____	_____	_____
d) _____	_____	_____

11. Please indicate your major source of Finance giving ratings **(Excellent / Goods / Satisfactory / Poor)** for services provided by the agency.

Source	**Quality of Services**	**Source**	**Quality of Services**
a) Commercial Bank	_____	f) SIDBI	_____
b) State Financial Corp.	_____	g) Own Funds	_____
c) State Indl Dev. Corp.	_____	h) Others, please specify	
d) IDBI	_____	_____	_____
e) IFCI	_____	_____	_____

12. a) Please specify the problem you have faced in financing your business

iv) _____
v) _____
vi) _____

b) Suggest measures for their improvement in the same order.

iv) _____
v) _____
vi) _____

13. Please indicate performance of your company for the following years.

Year	**Turnover (Exports)**	**Profit / Loss**
93-94	_____	_____
94-95	_____	_____
95-96	_____	_____
96-97	_____	_____
97-98	_____	_____

14. Has your company imported Hardware / Software? Y/N

If yes, please indicate.

	Name of Items Imported	**Year**	**Value**	**Country**
a)	_____	_____	_____	_____
b)	_____	_____	_____	_____
c)	_____	_____	_____	_____

15. a) Are you an ancillary to a large Software House **Y / N**
b) **If yes**, do you supply to other customers as well? **Y / N**
If yes, What %age in value of the total sales relates to other customers.

---

16. Please specify your sales (in Rs. Lacs)

Country	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

17. Please specify your domestics sales in Rs. lacs

93-94	**94-95**	**95-96**	**96-97**	**97-98**

18. What is the export market strategy of your Company? Please tick mark the right choice.

a) Through branch office abroad _____
b) Through Govt. Agency _____
c) Through attending international conferences/exhibitions _____
d) Through broaker _____
e) Others, please specify _____ _____

19. a) Please specify your export market problems

i) _____
ii) _____
iii) _____

b) Suggest measures for improvement in the same problems

i) _____
ii) _____
iii) _____

20. a) What is your perception of Indian software in International market?

_____
_____
_____

b) Suggestions, if any improve it

_____
_____
_____

21. What should be done to promote local software industries. State in order of preference giving rating from 1 to 7.

Preference (Ranking)

a) Change in Govt. policies _____
b) Improve Quality of products _____
c) Financial Soundness _____
d) Cut down of prices _____
e) Any other, please suggest _____

_____

22. Please indicate number of workers employed in your unit

At start	**92-93**	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**
a) 1-20						
b) 21-50						
c) 51-100						
d) 101-200						
e)above 200						

23. Please indicate number of workers leaving jobs.

	Number of Workers		**Number of Workers**
a) Within one years	_____	c) Within 5 years	_____
b) within 2 years	_____	d) Within 10 years	_____

24. Indicate the causes of job changes giving rating from 1 to 7.

	Rating		**Rating**
a) For higher wages	_____	e) For better technical environment	_____
b) Job security	_____	f) Closure of unit	_____
c) Lack of job satisfaction	_____	g) Any other, please specify	_____
d) For better working conditions	_____	_____	_____

25. Total number of persons employed

	Programming			**Non – Programming**		
	Univ. Prof. Deg.	**Comp. Dip.**	**Non-Tech.**	**Univ. Prop. Deg.**	**Comp. Dip.**	**Non-Tech.**
1993-94	_____	_____	_____	_____	_____	_____
1994-95	_____	_____	_____	_____	_____	_____
1995-96	_____	_____	_____	_____	_____	_____
1996-97	_____	_____	_____	_____	_____	_____
1997-98	_____	_____	_____	_____	_____	_____

26. a) Please state the problems which you face in the employment of skilled IT professionals

_____
_____
_____

b) Type of skill required_____
_____

c) Suggest how to improve availability of skilled manpower

_____
_____
_____

27. What system of wage payment do you undertake? Please tick the right choice

a) Piece Rate based wages _____
b) Fixed wages _____

28. a) Does the training facilities are adequately available locally? **Y / N**
b) **If not,** suggest measures need to be taken.

---

29. Tick mark the right choice in regards to Technology used in your company,

a) Indigenous _____
b) Foreign _____

30. If Foreign Technology is used,
Does indigeneous technology is also available? **Y / N**
If yes, what is the reason for opting Foreign technology

---

31. Do you use specialized infrastructural Govt. facilities? **Y / N**
If yes, please state which facilities are used. Tick the right choice.

	Adequate	**Inadequate**
i) Datacom Facilities	_____	_____
ii) Regulatory services by STPI	_____	_____
iii) Others, place specify		
_____	_____	_____
_____	_____	_____

32. In your view what are the various factors which contribute to the better growth of the software/ IT Industry. State whether available adequately in your state.

33.

Factors	**Adequately Available**	**Inadequate**
a) _____	_____	_____
b) _____	_____	_____
c)_____	_____	_____
d)_____	_____	_____
e)_____	_____	_____

33. Please give suggestions how above factors / requirements can be improved (**Answer serialwise)**

a)_____
b)_____
c)_____
d)_____
e)_____

34. What changes or improvements you will advocate in the IT policy of your state?
a)_____
b)_____
c)_____
d)_____

35. What are the factors which affect growth of Software Industry.
Please state in order of preference giving ranking from 1 to 7.

	Ranking
a) Political uncertainty	_____
b) Govt. Policies	_____
c) Govt. Incentives	_____
d) Availability of infrastructure facilities	_____
e) Funding procedures	_____
f) Technological innovations	_____
g) Any other, please specify_____	_____
_____	_____

36. a) Do you consider Govt. policies & efforts in the promotion of software Industry are adequate? **Y/N**
b) **If not,** please give suggestions to improve
i)_____
ii)_____
iii)_____
iv)_____

37. What are the high growth factors (strengths) of your company?
a)_____
b)_____
c)_____
d)_____

38. Is your Company located in an export processing Zone (EPZ)? **Y /N**

39. Is your company located in STP complex? **Y /N**

40. Do you prefer an EPZ / STP to locate your software export unit? **Y /N**
If yes, please specify the reasons.

41. Whether inhouse R&D facility exists in your company? **Y /N**

42. What are the low growth factors (weaknesses) of your company.

a)_____
b)_____
c)_____

d)_____

43. State level Electronics Corporations have been set up for promotion and development of electronics/ IT in their respective states.

a) Do you think your state electronics Corporations has been successful in its objectives? **Y/N**

b) What steps do you suggest this corporation should take up to bring improvements?
i) _____
ii)_____
ii)_____
iv)_____

44. Software Technology Parks have been set up for promotion and development of software/ IT Industry in their respective jurisdictional states.

a) Do you think that STP from where you are availing services has been successful in its objectives? **Y/N**

b) What steps do you suggest this STP should take up to bring improvements?
i)_____
ii)_____
iii)_____
iv)_____

45. Do you think incentives already being provided to Software/ IT Industry by the State in which your unit is located are adequate? (Tick the right choice). **If No,** please suggest change required.

Incentives	**YES**	**NO**	**Changes Suggested**
a) Sales Tax	____	____	_____
b) Professional Tax	____	____	_____
c) Land Subsidy	____	____	_____

d) Octroi	____	____	_____
e) R&D assistance	____	____	_____
f) Feasibility Study assistance	____	____	_____
g) Others, please specify			
_____	____	____	_____
_____	____	____	_____

46. Please suggest additional incentives (in addition to those mentioned in question 45) which will help in further growth of software industry.

a)_____
b)_____
c)_____
d)_____

47. Any other suggestions not covered above for the better growth of the Software Industry of your State

a)_____
b)_____
c)_____
d)_____
e)_____

48. Particulars of the person who have filled up this form

Name_____ Designation _____

Signature_____ Date _____ Place _____

ANNEXURE - III

QUESTIONNAIRE FOR EXPERTS IN ELECTRONIC INDUSTRY

(Contains 26 Questions)

1. Name of the Organisation working in_____

   Designation_____

2. Address: Head Office _____
   Telephone _____
   Fax_____
3. Paid-up Capital of the organization_____
4. When was your Organisation incorporated? _____

5. Do you think growth of electronics units in your state is adequate? **Y / N**

   i) **If yes,** list the factors contributing to this growth in following sectors:

   a) Consumer Electronics_____

   _____

   b) Components _____

   _____

   c) Communications _____

   _____

   d) Industrial Electronics _____

   _____

   e) Computers _____

   _____

   f) Others (Allied) _____

   _____

   ii) **If not,** give reasons for inadequate growth? Please indicate in order of preference giving ranking.

Reasons	**Ranking**
a) Office procedures & red tape	_____
b) Low performance with action plans	_____
c) Inadequate incentives by the state	_____
d) Inadequate infrastructural facilities	_____
e) Inadequate R&D facilities	_____
f) Any other, please specify _____	_____
_____	_____
_____	_____

6. Please give suggestions to improve on each of the above aspects.

   a) _____

   b) _____

   c) _____

   d) _____

   e) _____

   f) _____

   _____

7. What are India's strengths which can enable it to become a global player in electronics.

a) _____

b) _____

c) _____

d) _____

8. What are India's major weaknesses which hinder development of electronics industry in the country?

a) _____

b) _____

c) _____

d)_____

9. Under what conditions Indian electronics Industry is growing? Please give ranking in order of preference.

Preference Ranking

a) Rapid changes in technology _____
b) Rapid changes in the market conditions _____
c) Intense international competition _____
d) Rapid fall in prices_____
e) Any others, please specify _____
_____

10. How the electronics Industry should develop a market orientation to get advantages of scale? (900 million population of India itself may provide an excellent market!)

a) _____

b) _____

c) _____

d) _____

11. Suggest innovative applications of electronics so that it is linked with tackling the national problems like unemployment, poverty and population explosion.

a) _____

b) _____

c) _____

d) _____

12. Suggest measures to get a definite break through in the pace of dev. of electronics in your State.

a) _____

b) _____

c) _____

d) _____

13. Is there any change needed in the policy of imports & exports so far as electronics is concerned?

Y / N. **If Yes,** please specify below.

a) _____

b) _____

c) _____

d) _____

14. Suggest steps how the transfer of indigeneous technology to local electronics units can be improved.

a) _____

b) _____

c) _____

15. Does your State EC/STPI/State Govt. is doing enough for promoting electronics financing?

Y/ N. **If No,** please suggest how to further improve it.

_____

_____

_____

16. Does your State EC/State Govt. is doing enough to enhance the strength of electronics manpower in your State? **Y / N**
If No, please suggest how to further improve it.

_____

_____

_____

17. a) Which State in India have highest growth of electronics?_____
b) In your views, what are the reasons for their better growth?

_____

_____

_____

18. a) Do you think that the incentives given by your state to this Industry are adequate? **Y/N**
If not, suggest improvements/ additions/ deletions required.

_____

_____

_____

19. a) Do you think your State EC/ State Govt. is in proper communication with the Industry i.e. both industry and the org. understand requirements of each other. **Y/N**
If No, suggest steps to improve it

_____

_____

_____

20. How your State EC/ State Govt. can do better so that share of contribution of your State to the national electronics production is increased.

a)_____

b)_____

c)_____

d)_____

21. What will be the status of electronics industry in the world in the year 2005 and 2010?

YEAR 2005

a)_____

b)_____

c)_____

YEAR 2010

a)_____

b)_____

c)_____

22. What electronics products will get main focus in the year 2005 and 2010?

YEAR 2005

a)_____

b)_____

c)_____

23. **YEAR 2010**

a)_____

b)_____

c)_____

24. Where will India stand in electronics industry in the year 2005 & 2010?

YEAR 2005

a)_____

b)_____

c)_____

YEAR 2010

a)_____

b)_____

c)_____

25. What should be the short/ long term policy of the Govt. to give impetus to electronics industry in India?

SHORT TERM POLICY

a)_____

b)_____

c)_____

LONG TERM POLICY

a)_____

b)_____

c)_____

26. Particulars of the person who have filled up this form

Name _____ Address _____

Signature: _____ Date : _____ Place : _____

ANNEXURE - IV

QUESTIONNAIRE FOR EXPERTS IN SOFTWARE INDUSTRY

(Contains 27 Questions)

1. Name of the Organisation working in_____

2. Address: Head Office_____
   Telephone _____ Fax_____

3. Paid-up Capital of the organization_____

4. When was your Organisation incorporated?_____

5. Do you think growth of software units in your state is adequate? **Y / N**
   i) **If yes,** list the factors contributing to this growth
   _____
   _____
   _____
   _____
   ii) **If not,** give reasons for inadequate growth? Please indicate in order of preference giving ranking.

Reasons	**Ranking**
a) Office procedures & red tape	_____
b) Low performance with action plans	_____
c) Inadequate incentives by the state	_____
d) Inadequate infrastructural facilities	_____
e) Inadequate R&D facilities	_____
f) Any other, please specify _____	_____
_____	_____

6. Please give suggestions to improve on each of the above aspects.
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____
   _____

7. What are India's strengths which can enable it to become a global player in software.
   a) _____
   b) _____
   c) _____
   d)_____

8. What are India's major weaknesses which hinder development of software industry in the country?
   a) _____
   b)_____
   c)_____
   d)_____

9. Under what conditions Indian software Industry is growing? Please give ranking in order of preference.

Preference Ranking

a) Rapid changes in technology _____
b) Rapid changes in the market conditions _____
c) Intense international competition _____
d) Rapid falll in prices_____
e) Any others, please specify _____

_____

10. How the software Industry should develop a market orientation to get advantages of scale?

a) _____

b) _____

c) _____

d) _____

11. Suggest innovative applications of software so that it is linked with tacking the national problems like unemployment, poverty and population explosion.

a) _____

b) _____

c) _____

d) _____

12. Suggest measures to get a definite break through in the pace of dev. of software in your State.

a) _____

b) _____

c) _____

d) _____

13. Is there any change needed in the policy of imports & exports so far as software is concerned?

Y / N. **If Yes,** please specify below.

a) _____

b) _____

c) _____

d) _____

14. Suggest steps how the transfer of indigeneous technology to local software units can be improved.

a) _____

b) _____

c) _____

15. Does your State EC/STPI/State Govt. is doing enough for promoting software financing? **Y/ N.**

If No, please suggest how to further improve it.

_____

_____

_____

16. Does your State EC/STPI/Sate Govt. is doing enough to enhance the strength of software manpower in your State? **Y / N**

If No, please suggest how to further improve it.

_____

_____

_____

17. a) Which State in India have highest growth of software?_____
b) In your views, what are the reasons for their better growth?

_____

_____

_____

18. a) Do you think that the incentives given by your state to this Industry are adequate? **Y/N**
If not, suggest improvements/ additions/ deletions required.

_____

_____

_____

19. a) Do you think your State EC/STPI/ State Govt. is in proper communication with the Industry i.e. both industry and the org. understand requirements of each other. **Y/N**
If No, suggest steps to improve it

_____

_____

_____

20. How your State EC/STPI/ State Govt. can do better so that share of contribution of your State to the national software production is increased.

a)_____

b)_____

c)_____

d)_____

21. What will be the status of software industry in the world in the year 2005 and 2010?

YEAR 2005

a)_____

b)_____

c)_____

YEAR 2010

a)_____

b)_____

c)_____

22. What software products / areas will get main focus in the year 2005 and 2010?

YEAR 2005

a)_____

b)_____

c)_____

23. **YEAR 2010**

a)_____

b)_____

c)_____

24. Where will India stand in software industry in he year 2005 & 2010?

YEAR 2005

a)_____

b)_____

c)_____

YEAR 2010

a)_____

b)_____

c)_____

25. Where will your Stat stand in software industry in the year 2005 and 2010?

YEAR 2005

a)_____

b_____

c_____

YEAR 2010

a) _____

b)_____

c)_____

26. What should be the short/ long term policy of the Govt. to give impetus to software industry in India?

SHORT TERM POLICY

a)_____

b)_____

c)_____

LONG TERM POLICY

a)_____

b)_____

c)_____

27. Particulars of the person who have filled up this form

Name: _____Address _____

Signature: _____ Date : _____ Place : _____

ANNEXURE - V

THE LIST OF ELECTRONICS UNITS, SOFTWARE UNITS AND EXPERTS FROM WHOM FILLED-UP QUESTIONNAIRES WERE COLLECTED / RECEIVED DURING THE STUDY

KARNATAKA STATE

Electronics Industry

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Dirla 3M Ltd. 48-51. Keonics Electronics City, Bangalore	3-2-99	Nagraj D. Maskeri, Manager-Technical
2.	Dalmia Cement Bh. Ltd., Electronics Div. 53, Keonics Electronics City, Bangalore	5-2-99	B.V. Murthy, G.M. & Chief Executive
3.	Namtech Electronics Devices Ltd, 102, Keonics Electronics City, Bangalore	3-2-99	M. Sadanandan, GM (Manufacturing)
4.	VXL Instruments 86, Keonics Electronics City, Bangalore	3-2-99	C R Ravi, Senior Executive
5.	Ylokogawa Blue Star Ltd., 96, Keonics Electronics City, Bangalore	3-2-99	D. Harikishan Dy. Manager
6.	Teknic Electromeconics Pvt. Ltd., 93, Keonics Electronics City, Bangalore	5-2-99	Shyam Jaising, Managing Director
7.	Elbeam Devices Ltd. 90, Keonics Electronics City, Bangalore	5-2-99	R. Ramakrishna, Manager-Engineering
8.	Motwane Pvt. Ltd. , Keonics Electronics City, Bangalore	5-2-99	K S Surya Kumar, Manager

Software Industry :

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Infosys Technolgoies Ltd., Keonics Electronics City, Bangalore	2-2-99	C. Vijay Kumar Sr. Mgr. Infrastructure Development
2.	Yokogana Blue Star Ltd. Keonics Electronics City, Bangalore	3-2-99	R. Rajaram GM (Export Division)
3.	Ashok Leyland Information Technolgoy Ltd., 106/STPI, Keonics Electronics City, Bangalore	2-2-99	VB Sudarshan, Consultant

4.	International Comptech. Engineering Services Ltd, 212/STP, Keonics Electronics City, Bangalore	2-2-99	P.K. Ramesh Project Manager
5.	Altair Software India Pvt. Ltd., 314/STPI, Keonics Electronics City, Bangalore	2-2-99	Deepak K Vinchhi, Managing Director
6.	I-Link Software 208/STPI, Keonics Electronics City, Bangalore	2-2-99	Wg. Cdr. V. Rathan, Vice President
7.	Tomahawk Sw. (India) Pvt. Ltd., 205/STP, Keonics Electronics City, Bangalore	2-2-99	TV Raja Rao Manager-Operations
8.	Sanyo LSI Tech. India Pvt. Ltd. I.T. Park, Whitefield Rd. Bangalore	4-2-99	K. Vinay Bhat Assistant Manager
9.	Dev Centre Software SG Pvt. Ltd., IT. Park, Whitefield Road, Bangalore	4-2-99	Anjan Bose, Chief Operating Officer
10.	Rotary MEC Engg. (I) Pvt. Ltd. I.T. Park, Whitefield Road, Bangalore	2-2-99	VB Desai Engineering Manager
11.	Ericsson Communication Pvt. Ltd. Prestige Meridian, MG Road, Bangalore	6-2-99	Mohammed Aslam, Senior Engineer
12.	Microland Technologies (I) Pvt. Ltd., Prestige Meridian, MG. Road, Bangalore	6-2-99	Shams Ahsan, G.M.
13.	**Software & Silicon Sys. Pvt. Ltd., Prestige Meridian, MG. Road, Bangalore**	**9-2-99**	**D. Lale Shmisha, G.M.**

UTTAR PRADESH

Electronics Industry

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Salora Intl. Ltd., 7/Sector- 16, Noida	22-1-99	Rajiv Srivastava Marketing Manager
2.	Super Cassettes Ind. Ltd., C-5/Ph.II, Noida	21-1-99	Sunit Kummar Jha, Accounts Officer
3.	Moser Baer India. Ltd., NEPZ, Noida	19-1-99	CM Malla Personnel Manager
4.	Beltek (India) Ltd., C-12/Sec. 57, Noida	21-1-99	RS Kandhar Vice-President
5.	Oscar International Ltd., E-41, Sec.8, Noida	21-1-99	Sudhir Jain, Commercial Executive

6.	Catvision Products Ltd., E-14/Sector- 8, Noida	21-1-99	Anuj Kumar, Manager Projects
7.	Logitronics Pvt. Ltd. F-8/Sector – 3, Noida	22-1-99	Prasun Mittal, Manager (Manufacturing)
8.	Setech Electronics Ltd., 30/Sector- 16, Noida	22-1-99	AK Pathria, Manager
9.	SL Electronics Pvt. Ltd., C-68/Sector – 4, Noida	22-1-99	AK Banaerji, G.M.

Software Industry :

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Tata Infotech Ltd., 4, NEPZ, Noida	21-1-99	AK Saha, Vice-President (Signed by Ex to VP)
2.	Metamor Gobal Solutions Ltd. 9, NEPZ, Noida	20-1-99	Vikas Datt, Co-ordinator-Business Development
3.	Interra Software (I) Pvt. Ltd., 14, NEPZ, Noida	20-1-99	Lt. Col. R.P. Trikha, DGM
4.	Birla Horzons Intl. Ltd., Sector- 29, STPI, Noida	20-1-99	T. Ravi, G.M. Services
5.	R. Systems (India) Pvt. Ltd., Sector- 29, STPI, Noida	18-1-99	Rajiv K. Malhotra, GM (IT)
6.	Leaf Writers (I) Pvt. Ltd., Sector- 29, STPI, Noida	20-1-99	Ajay Gupta, Director
7.	NetBase Computing (I) Pvt. Ltd. Sector- 29, STPI, Noida	20-1-99	Rajiv Gupta, M.D.
8.	Network Programms (I) Pvt. Ltd., B-1-C, Sector- 10, Noida	20-1-99	Arun Kapania, Group Corporate V.P. (Technical)

PUNJAB STATE

Electronics Industry

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Alliedtronics (I) Ltd., 38, Phase VIII, ELTOP, Mohali	16-12-98	Munish Kumar Saini Managing Director
2.	Punjab Communications Ltd., 135, Phase VIII, ELTOP, Mohali	23-12-98	P S Johar, Joint Manager
3.	Semiconductor Complex Ltd., Phase VIII, ELTOP, Mohali	24-12-98	AK Saini, Manager (Marketing)
4.	Adonis Medical Equipments (Pvt.) Ltd. Phase VIII, Eltop, Mohali	14-12-98	Arun Kaul, Director

Software Industry

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Punjab Communications Ltd., 135, Phase VIII, ELTOP, Mohali	24-12-98	Harmeet Singh, Assistant Manager (Marketing)
2.	Konstruct Systems SCF 5, Sector- 7, Chandigarh	21-12-98	Alok Ramsisaria Director
3.	ATEC Software (Pvt.) Ltd. SCO 50, Sec. 34-A, Chandigarh	17-12-98	Sabodh Saggi Managing Director
4.	Case Computers (Pvt.) Ltd. SCO 1A, Sector.- 7, Chandigarh	14-12-98	Vijay Kumar Managing Director
5.	Regional Computer Centre, GoI, SCO 114, Sector- 17, Chandigarh	13-1-99	T N Misra, Director
6.	Inde Dutch System (I) Ltd. SCO 144, Sec. 34, Chandigarh	3-2-99	Tapank Mandal Head-Engineering

HARYANA STATE

Electronics Industry

S. N.	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	Shyam Telecom Ltd., 246, Ph. IV, Udyog Vihar, Gurgaon	15-6-99	PR Bansal GM (P)
2.	Bergen Electronics Ltd., 690, Ph. V, Udyog Vihar, Gurgaon	31-12-98	BC Debnath Manager-Corporate
3.	Bhuri Electroniks Pvt. Ltd., 107, Ph. I, Udyog Vihar, Gurgaon	1-10-99	Ajit Singh Bhuriji Joint M.D.
4.	XO Thonics Ltd., 28, Electronics City, Sector-16, Gurgaon	31-12-98	Pankaj Sharma, Factory Manager
5.	Chawla Enterprises Ltd., 14, Sector- 18, Gurgaon	31-12-98	TC Dhamija FC
6.	Universal Electronics & Com. (P) Ltd., 238, Ph. I, Gurgaon	30-12-98	Pradeep Kumar, VP (Corp. Affairs)
7.	Benning SMC Power Systems (P) Ltd. Electronics City, Sector-16, Gurgaon	15-6-99	SK Jatana ED
8.	SGS TekMKS Pvt. Ltd. Gurgaon	20-12-97	JS Gujral Director

Software Industry

S. N	Name & Address of Company	Date of Questionnaire	Person who have filled up Questionnaire
1.	SQL Star Intl. Ltd., STPI, Electronics City, Gurgaon,	31-12-98	Santosh Seth Assistant Manager
2.	Polaroid India Pvt. Ltd., Udyog Vihar, Ph. V, Gurgaon	15-6-99	Mahender Kumar Manager Planning
3.	MX Software Services Ltd. Udyog Vihar, Gurgaon	31-12-98	VG Raman, Director-Intl. SW Operations

EXPERTS FROM PUNJAB AND HARYANA

Experts from Electronics Industry

S. N	Name & Address of Expert	State /Location	Date of Questionnaire	Expertise and Official Status of the Expert
1.	Lt. Col. Inderjit Singh, Principal Advisor, Fujitsu India Telecom Ltd., Mohali.	Punjab	16-12-1998	• Served in Indian Army in the Corps of Signals and retired as *Lt.Col.* • After retirement from Indian Army served in Punjab Communications Ltd. (a large Electronics Manufacturing company of Government of Punjab) as its *Managing Director.* • At the time of filling up the questionnaire, the expert was working in Fujitsu India Telecom Ltd. (a JV between Government of Punjab and Fujitsu-Japan) as its *Principal Adviser.*
2.	Mr. S.K.Amberdar, Manager, Strategic Planning & Co-ordination, Semiconductor Complex Ltd., Mohali	Punjab	06-01-1999	• The expert was working as *Manager (Strategic Planning & Co-ordination)* during 1999 in the Semiconductor Complex Ltd., a Government of India enterprise engaged in design, development and manufacturing of VLSIs and VLSI based systems and sub systems.
3.	Mr. A.K.Pathak, Manager-Technical, Punjab Communications Ltd., Mohali.	Punjab	23-12-1998	• Mr. Pathak has long experience in handling technical aspects of various activities in the company engaged in manufacturing of Multiplexer, Electronic Switching Equipments, DTL Systems and Radio Systems.
4.	Mr. Sandeep Kapur, General Manager, Projects & Marketing, Haryana State Electronics Development Corporation Ltd., Chandigarh.	Haryana	20-01-1999	• Serving in the state Electronics Development Corporation engaged in the policy formulation and development of Electronics and Information Technology Industry in the state of Haryana.

Experts from Software Industry

S. N	Name & Address of Expert	State /Location	Date of Questionnaire	Expertise and Official Status of the Expert
1.	Brigadier S.S.Sahney, No. 1021, Sector-8C, Chandigarh	Punjab	21-12-1998	• Served in Indian Army in the Corps of Signals and retired as *Brigadier*. • After retirement from Indian Army served in Punjab State Council for Science and Technology, *Government of Punjab* and retired from this assignment as *DIRECTOR (Electronics & Computers)* in 1997-98.
2.	Dr. Sanjay Tyagi, Centre Head, Software Technology Parks of India, Mohali.	Punjab	16-12-1998	• Did his Ph.D. in Physics from Delhi University. • Serving in the Department of Electronics (now, known as Department of Information Technology), Government of India at STPI, Mohali as the *Centre Head.*
3.	Mr. Rakesh Agarwal, Asstt. General Manager, Electronics City & STP Centre, Haryana State Electronics Development Corporation, Gurgaon.	Haryana	01-01-1999	• Serving in the Haryana State Electronics Development Corporation (A Government Undertaking of Haryana) at STPI, Gurgaon as the *STP Incharge.*

ANNEXURE -VI

THE SCHEDULE OF PERSONEL VISITS BY THE INVESTIGATOR IN THE SAMPLE STATES

S N	**Personal Visits**	**Karnataka (**Bangalore**)**	**U.P. (**Noida**)**	**Haryana (**Gurgaon**)**	**Punjab (**Mohali**)**
1	**First Visit**	1-6, Feb.'1999	1-3, Jan.'1998	10-12, Dec'1998	14-17,Dec.'1998
2	**Second Visit**	8-9, April'1999	11th Mar.'1998	19th Dec.'1998	21-24,Dec.'1998
3	**Third Visit**	-	18-21, Jan'1999	30-31 Dec'98 + 1-2,Jan.'1999	13th Jan.'1999
4	**Fourth Visit**	-	15th Jun.'1999	-	3rd Feb.'1999