CHAPTER 9
SUMMARY AND CONCLUSION

For the last over 200 years, Neo-Classical economists had recognized only two factors of production: labour and capital. This is now changing. Information and Knowledge are replacing capital and energy as primary wealth assets, just as the latter replaced land and labour 200 years ago. Technological developments in the 20th century have transformed the majority of wealth creating work form physically- based to “knowledge-based”. In both developing and industrial countries, there is an increasing awareness of the importance of knowledge, and modern developed societies have become information based knowledge societies. New ideas, methods, skills, R&D, and learning-by-doing are intangible assets of a knowledge economy. Investment in knowledge building through education, and research and development (R&D) has further accentuated knowledge accumulation at a still accelerated rate. The development and integration of new knowledge leads to successful innovation. We are now an information society in a knowledge economy where knowledge management is essential (Dahlman and Utz, 2005).

Since early 1980s, and more specifically since early 1990s, the whole world is integrating as a global market economy, characterized by stimulated and unrestrained trade, capital and technology flows across geographical frontiers of countries (Vamvakidis, 1998; Navaretti and Tarr, 2000; Roller and Waverman, 2001). Globalization has induced the economies to exchange based on comparative advantage. Globalization not only leads to specialization and spatial concentration of commodity production, it also requires large sophisticated service industries. Globalization has made knowledge of world much more easily available than ever before. This changing economic scenario has far-reaching implications for employment, productivity, and efficiency.

The process of globalization has led to the spread of new technologies across the world, particularly in the form of ICT, which has become the new buzzword for economic development both at global and local levels. Globalization, multilateralism and economic integration has lead the factor and labour markets to converge. Information and Communication Technologies (ICT) has quickened the pace of exchange and transactions. Thus, it has proved to be the vehicle of global integration. On the other hand, the process of globalization itself registered unhindered development
of ICT, hence a symbiotic relationship between globalization and spread of knowledge economy through the use of ICT has come to be strongly entranced in the global economic dynamic. Thus, ICT has set in an unprecedented growth of economic trends and commodity/factor price convergence across the global markets.

The 1990s have seen progressive integration of Indian economy into global economy. In the early 1990s, liberalization of investment, and foreign exchange regime stimulated industrial and service growth. With increase in the use of ICT in knowledge intensive sectors of the economy, India has a tremendous growth impetus to emerge as the fourth largest economy in the world. India’s telecommunication sector has registered rapid growth in recent years, spurred by economic reforms. India has largely developed around three functional pillars of the knowledge economy i.e., education, innovation, and ICTs (Dahlman and Utz, 2005).

Indian ICT sectors consist of Information Technology (IT) and Telecommunication. According to National Association of Software and Service Commission (NASSCOM), Indian IT industry is broadly categorized into three segments: IT Services and Software; IT-Enabled Services (ITES)-Business Processing Outsourcing (BPO); and Hardware segment. Telecommunication is another pillar of India’s ICT sectors. The Indian telecom market may be broadly categorized into telephony and internet services. Telephony services can be further divided into wire line (fixed-line services) and wireless (cellular and WLL).

Indian IT industry is of recent origin, but it has attained an important place in the economy. The industry’s contribution to national economic output has escalated nearly by six times, from less than 1 per cent in 1991-92 to 6.46 per cent in 2006-07. India enjoys enormous comparative advantage in the export of IT services. The rapid growth of the industry has been attributed to availability of human capital, entrepreneurship, social networking, favorable policy environment and entry of multinationals (Joseph and Harilal, 2001; Kumar; 2001; Taganas and Kaul, 2006; De and Dutta, 2007). India’s strong education framework ensured ample supply of technical and non-technical talent, while the establishment of Software Technology Parks of India (STPI) and later SEZs provided an enabling environment for the industry to flourish.

The present study proposes to highlight the growth and performance of ICT sector in India and analyze the role of IT investments in building and strengthening the knowledge economy of
India. The specific objectives of the present study are as follows:

1. To analyze the growth and development of ICT sectors in Indian economy and look into its contribution to different economic aspects of Indian economy.
2. To examine the physical and financial performance of the ICT industry and to investigate the determinants of profitability of ICT sectors.
3. To carry out an incisive analysis of the role and contribution of the ICT sector in various other productive sectors in the knowledge economy of India.
4. To examine whether there are any threats to the sustained growth of ICT industry and suggest policy recommendations to ward off those impeding factors.

Data, Scope and Methodology

Given the nature of the study, the data for the present study have been taken from different sources such as National Association of Software and Service Commission (NASSCOM), New Delhi, International Data Corporation (IDC), Gurgaon, Software Technology Park of India (STPI), Ministry of Commerce and Industry, Central Bureau of Health Intelligence, National Health Profile, Ministry of Human Resource development and World Bank reports. The data have been deflated by using implicit GDP deflator to transform these into real values for their true effect. Goldar (2004) used implicit deflator in the analysis of productivity trends in Indian manufacturing in pre- and post-reform periods.

The time span of the study ranges 1990 to 2010 because it merges with the period of economic reforms since when ICT sectors witnessed explosive growth, but, because of the recent emergence of the ICT industry, data for some variables were available for a lesser period of time i.e., 2000 onwards. All the concepts, terms, definition of different variables is in standard form as viewed by Annual Survey of Industries data and CMIE reports.

To examine the role of ICT investment in the knowledge economy of India, knowledge economy was defined in terms of knowledge intensive sectors where ICT intervention is quite phenomenal. Thus, drugs and pharmaceuticals, education, health and manufacturing have been used to represent India's knowledge economy to explore the contribution of ICT on the building and reinforcing India's economy.
Method and Tools of Analysis

The tools of analysis are the analytical methods to ascertain or measure the extent of relationship among the variables and analyze the changes thereof. Keeping in view the objectives of the study, various methods like charts, diagrams, Compound Annual Growth Rates (CAGR), Co-efficient of Variation, Ginni Co-efficient, Hirschman Herfindahl Index, Ratio Analysis, Linear Regression Analysis and Step Regression Analysis have been used.

Chapter Scheme

The chapterisation scheme of the study is as follows:
1. Globalization and the Emergence of Knowledge Economy in India: A Theoretical Context
2. Review of Literature
3. Data Scope and Methodology
4. WTO, Globalization, and Relevance of ICT Sectors in the Knowledge Economy
5. Evolution and Structure of ICT Sectors in India
6. Growth and Performance of ICT Sectors in India
7. Role of ICT Sectors in the Knowledge Economy of India
8. Government Measures, Challenges, Policy Implications and Prospects
9. Summary and Conclusion
10. References

Major Findings and Conclusion

The following are the major findings that emerge directly from the analysis of the subject:
1. It is observed that the market for computer software and computer hardware is highly competitive. Smaller value of The Herfindahl Index (H-Index) for computer software and computer hardware industry indicates dispersion of market shares. The market for mobile services is much more competitive than the one for fixed line services.
2. It has been observed that the major part of India’s IT industry has remained concentrated in about 5-6 urban centers or tier-I cities such as Bangalore, Mumbai, Hyderabad, Delhi (including Noida and Gurgaon or NCR) and Chennai. The high value of Ginni Coefficient shows that distribution of firms is skewed towards few areas.
3. With a modest beginning in the early 1990s, IT export revenue has grown at a higher and
statistically significant and higher rate within domestic markets. Software exports have been virtually driving the growth of export revenue of the IT industry. Since 1999-00, Indian IT Enabled Services (ITES) has emerged as a key driver of growth for the Indian IT industry.

4. In the area of job creation, nearly 2.1 million work force is employed directly in the industry. Indian IT sector has helped create an additional 8 million job opportunities through indirect and induced employment by 2008. Customer care, content development, finance and administration are important sub segments for employment in Indian IT industry.

5. The high value of co-efficient of variation in landline and cellular subscribers across different states in India shows that there is wide disparity in the availability of telephone services among different states. This growing digital divide is a reflection of growing divide within the country as far as income and wealth are concerned.

6. Segment wise breakup of the ICT industry shows that IT sector recorded higher and statistically significant growth rate for sales, revenue, gross value added, wages, gross fixed assets, current assets, inventory, net worth, current liabilities, gross profits, profit before tax, profit after tax, export earning and import payments than those in telecommunication sector.

7. Wages are closely related to labour productivity (Kumar, 2001). It has been found that of the two segments of the ICT sectors, telecommunication segment has higher ratio of revenue per unit of wage bill than that in the IT segment, probably owing to lower rates of employee compensation. Telecommunication sector has been able to improve productivity since 2002-03. On the other hand, in IT segment, labour productivity has declined over the period under consideration.

8. Gross profit margins and net profit margins have been increasing in the IT industry and ICT sector as a whole since 1995-96 except for 1999-00 and 2002-03. In ICT sectors, asset turnover ratio has been rising since 1997-98. As a result return on investment has increased in the ICT sectors implying that the increase in capital employed has been profitably utilized.

9. A high return on equity reveals the performance and strength of the firms in attracting future investment. Return on equity and earning power in ICT sector has been rising since 2002-03. Earning power represents overall profitability of an enterprise/sector.

10. An analysis on determinants of profitability explores the effect of size, concentration ratio,
product differentiation and export intensity on profitability. We find that out of six variables, four variables namely, advertising intensity, capital-output ratio, growth in demand and ratio of wages to total cost are found statistically significant for variation in profitability of ICT sectors in India, and 72.74 per cent variation in profitability of ICT sectors is explained by those significant variables.

11. To analyze the effect of IT spend on the growth and building up the knowledge economy of India, it is found that IT spending to total cost ratio is positively related to the number of patent applications filed in drugs and pharmaceutical sector, although the variable is statistically insignificant. In education sector, the effect of the share of ICT expenditure in total plan expenditure at secondary level on gross enrolment ratio is found to be positive though statistically non-significant. On the other hand, the effect of share of plan expenditure on education in total plan expenditure on education is found to be positive and statistically significant in explaining the variation in gross enrollment ratio.

12. Regarding the relationship between IT spending and growth of healthcare sector, the analysis revealed that IT spending to total cost ratio explains 51.60 per cent variation in the number of people benefitted from anti-epidemics measures of the Government of India.

13. In manufacturing sector, stepwise regression analysis revealed that out of three variables, only export intensity comes out to be statistically significant.

Thus, out of the four sectors, relative IT spending as a proportion of total cost comes out to be statistically significant variable in health sector only. In India, IT applications were made in different sectors of the economy in early 2000s. We could say that the relation between technology spending and industrial performance is complex one and all the participants in the industry may not gain by it. All the firms in the industry are not alike and benefit differently from expenditure on technology.

**Recommendations and Policy Implications**

1. The analysis reveals a phenomenal contribution of ICT sectors to the economy of India in terms of employment growth, revenue and income generation. The industry’s contribution to national economic output has nearly escalated by 6 times from less than 1 per cent in 1991-92 to 6.46 per cent in 2006-07. The share of IT exports in the total service exports of India has increased to 35 per cent in 2008. Thus, strong policies for further development should be
framed to improve ICT sectors in India.

2. The analysis reveals a spatially concentrated growth pattern of ICT investment in the few major IT hubs in the country. Although we found the industry to be competitive with considerable dispersion of market share, yet, since an inverse relationship between economic and geographical concentration with profitability has been found, it is recommended to further decentralize and decongest a few locations so that its externalities may be realized for the explosive growth of the sector. Therefore, the industry should be decentralized beyond existing hubs by developing new townships, IT parks and knowledge cities. Action will need to be taken across various fronts including: master plan development, financial arrangements, land acquisition and auction, proper re-settlement of displaced persons, aviation and transportation planning and educational linkage.

3. The influence of advertising intensity and export intensity on profitability has been found positive. IT exports are an important and increasing component of output and employment in the IT sector. Therefore, there should be aggressive policy measures to boost advertisement expenditure and exports so as to further increase the profitability of ICT sectors. In spite of US backlash to cut outsourcing of jobs to Indian IT industry, it must cut cost and strengthen their global delivery models.

4. Capital output ratio has been found to be inversely related to the profitability of ICT sectors. Therefore, efforts should be made to improve the ratio through new research and development, train the work force that has the critical skill to use this technology.

5. Unlike old technologies, the new technologies are supply-driven and leave greater scope for the diffusion agents (non-governmental organization, government, private sector and others) to influence diffusion process. Internet cafe, community internet centers, fixed lines and mobile phones, smart cards and satellite television can influence connectivity and information infrastructure. It will help reduce the digital divide across the country and improve the delivery of services to rural population.

6. The telecom equipment sector is not able to meet demand created by the telecom service sector. Therefore, there is need to motivate growth of telecom equipment industry. This will also help the growth of other industries through forward and backward linkage. Public-private partnerships should be promoted and encouraged.
7. To enhance the role of ICT in the economy, the state governments should revise the ICT policies from time to time and contribute more to make the state sector more ICT oriented.

8. The US continues to be the biggest market for the IT industry. Therefore, Indian IT industry needs to balance its geographical footprint to get a larger share of revenue from other parts of world like West Asia, Latin America, South Africa, Eastern Europe and Australia. Diversifying into new markets will not only counter the impact of recession in a particular geography, will also be a natural hedge against currency fluctuations.

9. Mostly, the Indian IT firms have ignored the domestic market. Less than 20 per cent of Indian population has access to a computer. With Indian economy growing at around 8 per cent and increasing IT spend; this is the time for the industry to look inwards. With the development of the domestic market the import of hardware could be curtailed and it will also help in the growth of employment in the country. Government of India has already taken a step in this direction and has unveiled a National Manufacturing Policy on June 09, 2011 (Sharma, 2011). The policy seeks to create 100 million industrial jobs by 2025.

10. Although the total stock of India’s educated and S&T human resource has shown a rising trend, yet the quality of human capital is low. Therefore, to strengthen knowledge economy of India, quality of primary and secondary education should be enhanced. The Government should ensure the expanded access to education that foster critical thinking and learning skills for all.

11. The curriculum of tertiary education should be reformed to include skill and competencies for the knowledge economy (communication skills, problem-solving skills, creativity and teamwork). Syllabus in computer engineering, electronics and IT in various technical institutions should be updated to meet the demands of industry. With improved quality and increase in the supply of IT professionals, the declining trend in the labour productivity can be reverted in IT segment of ICT sectors.