CHAPTER - 6

SUMMARY, CONCLUSIONS, FINDINGS AND SUGGESTIONS
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SECTION - A

6.1 Introduction:

The abundance of cheap labour and raw materials is no longer sufficient for global competition. Information, flexibility, product quality and fast response are the key new factors and information technology plays a critical role in these areas. That is why policy makers in industrialized countries and in an increasing number of developing countries view IT as a critical infrastructure for competing in an information intensive global economy and encouraging the widespread diffusion of IT. They also assess the potential gains from using IT based process to enhance their access to global knowledge, market and capital.

The diffusion process is responsible for the adoption and exploitation of new technology generated by the innovative process. After successful introduction in the innovating country new products and
process generally diffuse abroad. The first imitators normally are advanced countries, whose technical capabilities and resources permit the early identification of significant foreign developments and facilitate the actual transfer of technology. In addition, because the structure of demand is similar in advanced countries, there is a strong incentive for adopting innovations introduced in other advanced countries. The less developed countries often attract the eventual transfer of new technology by their lower wage rate, but usually the process is slower. However, several researchers argue that latecomers are better placed than even the advanced countries to take advantage of this new technology.

Developing countries face structural constraints that reflect in their market, institutional, technological, and infrastructure development, market failures and limited absorptive capacity are severe and pervasive.

In order to understand these in India, a regional level study has been undertaken to explore the pace and extent of diffusion.
Though general objective of this study is to assess the overall diffusion of technology specially IT in the country, specific objectives are as follows:

1. To review the role of technology and economic development and understand the interrelations between the two.

2. To assess the impact of information technology at sub-national level with reference to revenue earnings and employment.

3. To examine the ways of diffusion and pace of its percolation at different cities in Karnataka with the help of Software Technology Parks.

4. To examine the diffusion and adoption of ICT in specific industry viz., garment manufacturing industry in Bangalore.

5. To identify the factors inhabiting or promoting the diffusion of such technology to other parts of the state and to other sectors of the state economy.
6. Finally to suggest measures to improve the diffusion of technology for development.

6.2 Summary and Conclusions:

Information Technology industry is one of the most profitable global industries and is likely to be the largest industry before the end of the year 2020 A.D. The production and adaptation capabilities of local IT suppliers in certain IT segments such as application-specific integrated circuits, application software and computer support services are crucial of IT diffusion. Advanced states with large economies, skilled manpower and advanced industrial structures may thus build their technological capabilities in promising segments of the IT industry.

Some states are poor in infrastructures that are key to IT diffusion. Because these states are not home to major IT companies, they lack the user-producer networks that bring international know-how. Since the small, local users are unsophisticated and can no longer rely on intermediary institutions to organize them. They have limited bargaining
power with multinational suppliers. They lack shared facilities, support services, and other information channels.

Technical and managerial capabilities are an important ingredient for IT diffusion. These capabilities, beyond formal training, involve technology literacy, organizational learning capabilities, and integration of IT planning into business strategies. The ability to experiment and to change organizational and managerial practices, are key to diffusion. Managers are likely to resist imperatives such as information sharing, decentralized decision-making, and standardized business operations.

Government also weighs in on the development of the national information infrastructure and local information sharing, and legal protection for intellectual property and electronic, public information sharing, and legal protection for intellectual property and electronic transactions. The state can mobilize investment and research in support of IT. But many governments have ineffective relationships with business and the scientific community. Equally important is the potential to improve government capability as IT user. But cumbersome reporting,
poor information recording, restrictive information sharing policies, and slow and costly transaction systems create information to be poor, slow moving and unaccountable.

6.3 Findings From Secondary Data:

1. This study at regional level reveals that there is region specific development of IT in India. One of the reasons for a strong presence of IT industries in the southern leading states in India is due to establishment of technical colleges, institutes and universities which provided required qualitative and truly world class engineers. In addition with the revolution of electronics and communication the knowledge workers in these states, have easily become part of the global economy. In order to correlate this view, the data on number of colleges/ institute and their intake have been culled from the AICTE database. The results are truly encouraging and there is a strong correlation between the numbers of engineering graduates (in Computer Science, Electronics) coming out from these states and the establishment of ICT firms in such states.
2. Another important finding is that bandwidth or connectivity in a particular state matters. Now development will have to be measured not only by gross state domestic product but also per capita bandwidth. While software firms, other exporters and multinational require robust high-bandwidth international links, the great majority of Indian states have little access to the most basic voice services. It may seem that the needs of this range of users are so different that they require very different solutions. This is partly true, but technological convergence, and the fact that the domestic and international networks have interconnected and benefited for integrated approaches to infrastructure improvements. It is evident that the bandwidth available to different states through STPI centres vary from state to state. Karnataka state is leading with 37,184 kbps bandwidth available, accounting for 27.57 percent of the total bandwidth in the country, followed by Uttar Pradesh with 25.58 percent and Andhra Pradesh 21.16 percent and Maharashtra 11.77 percent. The second highest bandwidth available to Uttar Pradesh is
due to establishment of Noida STPI Centre, which covers the firms from Uttar Pradesh, Delhi and Madhya Pradesh. It is an Export Processing Zone under the control of Central Ministry. Andhra Pradesh is third due to presence of large number of foreign companies next only to Karnataka. Thus, we can say that the performance of information technology in these states is doing better compared to other states due to availability of sufficient bandwidth.

3. Success of IT in certain states is due to policy environment created by IT savvy chief ministers, who have shown a tremendous growth of their state economies. For instance, Karnataka has achieved 8 per cent growth rate as against 4.5 per cent of all India growth rate in 2002-03. Since 1991, India has pursued polices of economic liberalization, but policy reform has been uneven. Controls on private industry and non-tariff trade barriers have been removed or substantially reduced, but liberalization has been slower in certain states where there is clear interest group opposition, such as labour laws and privatization. Reform has also been slow in those states where new regulatory
institutions needed to be created; there is still a substantial amount of learning by doing that is taking place. Government revenue considerations also affect policy decisions in areas such as import tariffs and telecom privatization. The information technology sector in India is important not just because of its performance and potential, but because these factors have influenced the policy environment in India.

4. Further, it is observed, that successful diffusion programs rely on networks such as trade associations and chambers of commerce to spread knowledge. This approach is responsive to industrial traditions, local resources, and established client relations. It acknowledges that support and dissemination comes from private channels and local intermediaries. In this case the role of NASSCOM is appreciable as an important institution working as catalyst for IT development and diffusion.

5. Successful pilot e-governance programmes have made some perceptible change in the administration. First, back-office procedures
is made more efficient so that internal record keeping, flows of information and tracking of decisions and performance are improved. Second, when some basic information is stored in digital form, it provided the opportunity for easier access to that information by citizens. The simplest examples would be e-mailing requests or complaints, checking regulations on a web page, or printing out forms from the web so that a trip to pick up the forms from a physical office is avoided. More complicated possibilities are checking actual records, such as land ownership or transactions. Still there are more complicated cases where information is submitted electronically by the citizen.

6. The states which have the comparative advantages due to large pool of manpower (specially the south Indian states), with low cost of operation have succeeded in ITES. NASSCOM has forecasted that ITES will grow by 15 fold over 2002-08 with a US $21-24 million dollar of amount. They (off shore vendors) will save about 40-50 percent cost saving and vast availability of BPO market in the world,
growing at the rate of 12 percent per annum. NASSCOM has also forecasted that India’s revenue from ITES during 2001-02 was Rs.7100 crores and will grow Rs 8,100 crores by 2008. It has predicted that employment in the ITES industry could rise to 1.1 million by 2008. It has also revealed that ITES sector has emerged as leading employment generator with 68,000 people already employed and additional 36,000 jobs will be created in the year 2002-03. The top 5 focus markets for ITES companies include insurance, e-commerce, technology vendor, financial services and telecommunication services.

7. STPI – Bangalore was the first center where Internet was brought up in 1991, the city has the distinction of being the first city communication services in the country. A unique thing about STPI – Bangalore is the presence of a large Earth Station facility and VSAT Hub of ERNET. This VSAT network is connecting 125 educational and research institution across the country. This is the only facility in the country which has an international connectivity co-located with
the international gateway. Around 198 software-exporting companies have registered with STPI (Software Technology Park India) Bangalore during the year 2004-05 and the total comes to 1,520 companies as on 2005 and the software export growth rate of 52 percent and has touched Rs. 27,600 crores earnings once again Bangalore has maintained its leadership position in the country.

8. Today, Mysore city is attracting IT companies and showing signs of being able to handle all changes that take place in a big city. The city has an abundance of technical manpower and its moderate climate makes it an attractive destination. STPI-Mysore was started with the aim of promoting Software exports from secondary cities. This move is expected to go a long way in tapping the global potential in the Software market. The biggest gain will be the positive impact on the economic and social development in the this city. This gateway provides Internet services as well as international private leased lines. The setting up of communication services at STPI- Mysore has brought about a tremendous growth in the number of industries
operating successfully here. Major development areas in Mysore include software testing, software maintenance, and IT enabled services such as medical transcription etc. Many educational institutions are also using STPI services for meeting internal communication requirements. A forty meters microwave tower system delivers access to all parts of the city.

9. Though the number of companies registered at STPI-Mangalore/Manipal is less (19 companies during 2004-05) when compare to Mysore (33 companies during 2004-05), it has achieved Rs. 567 crores of software exports as against to Rs. 309 crores of software exports from Mysore STP for the year 2004-05. Mangalore/Manipal software exports is the second highest in the state after Bangalore.

10. STPI Hubli has 1,20,000 square feet of area. The city’s IT and telecom infrastructure and HR base are good. Its power distribution is separated and closely associated with Maharastra’s grid. Despite all these facilities the IT park in Hubli has not taken off as expected.
STPI is attempting to position Hubli, a commercial centre located between Bangalore and Mumbai, as a Disaster Recovery (DR) hub. It hopes that the city will become a focal point for DR services for the state government’s e-governance projects like Bhoomi, Khajane and VAT as well as for private players like Reliance.

6.4 Findings From Primary Data:

1. In order to ascertain the impact of IT on economy, a study of IT use in garment industry is undertaken. It is a non-IT industry using IT tools. This study intends to know the performance of firms using IT tools vis-à-vis those not using IT tools. The conclusions are interesting, before that a brief note on the garment industry in India is given.

The Indian garment industry occupies a unique place in the Indian economy. It contributes about 4 percent of GDP and 14 percent of industrial output. Second largest employer after agriculture, the industry provides direct employment to 35 million people including substantial segments of weaker sections of society. With a very largest net foreign exchange earner in India, earning almost 35 percent of
foreign exchange. This is the only industry that is self-producing every thing from fibers to the highest value added finished product of garments. Its growth and vitality therefore has critical bearings on the Indian economy at large.

2. This study reveals that the adoption of IT did not result in a reduction of job opportunities. On the other hand, IT improved quality standards and made the firm internationally competitive. Firms employing 1000 and above employees are ‘totally IT savvy’ while firms with 200 to 500 employs are ‘partially IT savvy’. The majority of firms operating in the domestic market use IT for office automation only. However, all firms, using IT in design, marker making and office automation are 100 percent export-oriented units, indicating that IT utilization is crucial for this type of operation.

3. With the dismantling of quotas in 2005 under mandate from the agreement in textile and clothing of the WTO, the focus has clearly shifted to the future of the Indian garment exports. The dismantling of the quota regime represents both an opportunity as well as a threat. An
opportunity because markets will no longer be restricted, a threat because markets will be no longer be guaranteed by quotas, and even the domestic market are open to competition, therefore all textile and clothing products are now traded internationally without quota restrictions. And this brings the issue of competitiveness to the fore for all firms in the garment sectors. In this background we have chosen some sample firms to understand their true competitiveness under the changing circumstance of the world.

4. One of the findings of our study on determination of competitiveness lies in the qualification of the managing director (MDs). Out of 60 firms, the MDs of 40 firms have the qualification of post graduation (PGDM or MBA) from reputed institutions. Therefore qualification of the managing director constitute the most important factor in the adoption of IT in manufacturing firms selected in the Bangalore region of the garment industry.

5. The adoption of new technologies requires a highly skilled workforce to achieve maximum benefit. This is particularly true in garment
manufacturing. Activities at several stages of manufacturing—grading, and pattern and marker making—are very skill intensive. In addition to their professional skills, employees at these workstations need knowledge to be able to use IT tools. Hence, a positive relationship between skill intensity and adoption of IT is observed in the study area.

6. Garment comes under a fashion industry. The design of a garment in a particular season does not remain the same for the next year, particularly in export markets. Information on the latest market trends is crucial for export-oriented units. Firms can keep track of market trends by using intranet, internet, and other IT tools. Out of 60 firms, 43 firms have acquired this information. Therefore, export intensity has emerged as an important determinant of the degree of IT adoption.

7. Further, it is observed that smaller firms have neither sufficient financial resource base for these investments nor the inclination to do so. This is because of the under-utilization of the capacity of IT tools. On the other hand, large firms are comparatively in a better position to
invest in new technologies. Hence we observed that the large number of employees, a proxy of the size of operations, can emerge as an important factor in influencing the adoption of IT.

8. Garment firms face stiff competition from neighboring countries like China, Sri Lanka, Bangladesh, Pakistan, and even from the developed nations. Many managing directors of our sample firms responded for adoption of IT is an inevitable phenomena for meeting the external competitive pressures. Therefore, external competitive pressure has influenced the degree of IT adoption.

9. From the field study it is observed that 76.4 percent of MDs of IT-n firms rate IT as very important tool in providing better management control. This is a possible reason for introducing IT in non-production activities by IT-n firms. MIS (Management Information System) provided better control at the financial and inventory levels. Based on this evidence, it is understood that the opinion of the MDs regarding capacity of IT tools to provide better management is emerged as one of the factors that have influenced the extent of IT utilization.
10. Further, it is also observed that firms in the garments industry, which have been in existence for quite a long time, are aware of technology evolution the world over. Older firms are also in better position to evaluate the performance of IT tools used in the garments industry. Therefore, it is observed that the age of a firm influences the adoption of IT.

6.5 Problems Identified in the study:

In this chapter, an analysis of various problems and challenges of IT diffusion are outlined and suggestions are offered for improvement of the IT diffusion. General problems of IT diffusion are discussed first, followed by specific problems of selected cities in Karnataka.
A. General Problems of IT Diffusion:

1. Lack of information on technical change, options and alternative suppliers of IT:

Information market failures are detrimental to a firm's ability to identify, assess, negotiate, procure, adapt and use a new technology. Imperfect information markets, for instance, limited a firm's knowledge about the availability of alternative technologies, most importantly, how to introduce, adapt and use the newly acquired technology in majority of the firms in our study.

Even though quite a lot of technical information is freely available from technical journals, suppliers of machinery, visits to exhibitions and the like, there is range of technical information not provided by the market. Some key technologies are simply not available off the shelf and can be acquired only through collaborating with firms that control the technology. The transfer of most technologies requires uncodified of tacit knowledge, which firms in developing states may not possess.
For example obtaining the knowledge required to purchase, install and use stand-alone computers, is easier than obtaining knowledge about computer-aided design (CAD), or computer-aided manufacturing (CAM). Knowledge relating to most of the initial IT applications in developing states—computerization of banks, airlines, ports, railways and utilities, and the automation of large transaction systems such as billing and inventory management—are relatively easy to access. But with industrial development, as states move up the technological ladder towards more sophisticated IT applications, the corresponding scientific and technological information requirements are also likely to become increasingly complex and costly, and it is a challenge in many developing states.

2. Lack of human capital skills needed for acquiring, adopting and using IT:

The IT revolution imposes tremendous demand for education and training, necessitating a complete revamping of academic curricula to strengthen education in mathematics, management, computer science, electronics engineering, and other engineering sciences. Given its generic
nature, users who invest in IT do not necessarily build on their own accumulated ‘technological capital’ and may require external support to develop IT adoption capabilities. It is becoming increasingly clear that skill shortages and changing skill requirements are the principal initial barriers to the introduction of new information technologies in the country.

3. Lack of finance for acquiring, adapting and using IT (especially the development of software and intangible information services):

Capital market volatility is one of the most important barriers to the innovation process. Small firms often found it difficult to obtain financing for such activity. Working capital normally covers the technological activities of production but is insufficient to cover training and other needs required for technological change. As industrialization proceeds and technological requirements become increasingly complex, this financing gap often becomes more serious and the financial systems in most developing countries are not able to provide such capital.
4. Lack of co-ordination between firms, universities and technology institutions:

Since technological innovation is interactive and operates as a system, its success depends not only on the quality of its elements but also on the synergy among them. Co-ordination failures between firms, universities and other relevant institutions may result in sub-optimal network externalities. Many governments have ineffective relationships with business and the scientific community. Equally important is the potential to improve government capability as IT user. But cumbersome reporting, poor information recording, restrictive information sharing policies, and slow and costly transaction systems create information-poor, slow-moving economies, and unaccountable public agencies.

B. Specific Problems:

1. Misallocation of resources for IT-related R&D captivities within firms:

Technology is not simply available off-the-shelf, and substantial research capability is often necessary to plug into outside information network, understand, and assimilate knowledge. The generic nature of IT,
its newness, and its rapid progress all suggest that a considerable amount of in-house R&D is essential for adopting more sophisticated IT applications—such as computer-sided and computer-integrated manufacturing or the application of microelectronics in products. Although in-house R&D may be essential for absorbing new knowledge, there are three main reasons why firms may not invest in R&D. (i) indivisibility because of minimum efficiency-scale levels; (ii) inappropriability of the profit stream of research, leading to a divergence between public and private returns on investment; (iii) uncertainty covered by research’s uneven levels of risk for private and public actors.

2. Problems of physical infrastructure like road, electricity, water and connectivity:

The city’s infrastructure, especially power and telecom, are not keeping pace with the information technology expansion. While the government promises uninterrupted power supply, the reality is far removed, and many IT-enabled service firms have to maintain their own back-up systems. This cranks up costs. In the early years of 1990s,
information technology sector in state has enjoyed the concession and tariffs on par with industry. But, recently, in the state of Karnataka, the information technology units are treated on par with commercial rate. Besides, power-cut is a common phenomenon in this state due to shortage of power. This will affect those units which totally dependent on Karnataka Power Transmission Corporation Limited (KPTCL). The city’s public transport infrastructure is very weak and this has resulted in many people buying their own vehicle.

3. Small and Medium Enterprises (SME) are unable to garner the market share:

At STPs there is hurdle of minimum export obligation of US$ 0.25 or three times of CIF value of imported capital goods, whichever is higher and the net foreign exchange earning of 10 per cent. This condition is not encouraging to SMEs in the industry. Considering the new emergent role of SME in recent years, there is a need to strengthen them.
4. Slow Diffusion Challenges:

Since skilled labour market is concentrated in Bangalore and advance in technology is associated with an increase in the demand for skills, there is a slow diffusion of information technology to other cities. It has become a big challenge to them especially to Hubli. No doubt, out of 28 states in India, nearly 18 states have announced their information technology policy by 2000, yet the penetration of information technology in such cities is very slow, thus, it is a big challenge for equitable development of cities.

5. Digital Divide:

The present study clearly reveals that the firms which are lagging behind in adopting IT will have to go with low earnings and high computer illiteracy. This led to worsening of exiting digital divide between IT-p and IT-n industries.
6.6 Policy Implications:

In this section suggestions emanating from the preceding findings are presented here for policy purpose. Suggestions are merely indicative of the direction in which policy has to be formulated. Those suggestions are as follows:

A. Suggestion for General Problems:

1. Foreign direct investment is a key channel of technology Diffusion, particularly for backward states with limited technological capability and industrial experience. Foreign investment transfer integrated resources; capital, technology, network capabilities, marketing expertise, management and organizational skills, product design skills, international standards, and total quality management. Such integration is key to IT use and success. Long –term foreign customers provide access to international know how and services. This is evident in India’s, export-oriented software industry. Foreign contractors of Indian professional services have provided access to the latest standards, technological platforms, productivity tools, quality
requirements, and up front financing, particularly to small software firms. “Learning by using” is crucial for IT. Feedback from users encourages improved products and process. The presence of multinational IT users and suppliers may be insufficient to diffuse global IT knowledge widely. States need to build networks at the national, regional and grass root levels. They should join the recent explosion of strategic alliances, co-operative research programs, information networks, and other forums of industrial countries. Regional forms would enable developing states to exchange experience, developing common IT applications, and address policy issues. Regional networks would provide links to growing international exchange and overcome lack of information on technical change, options and alternative suppliers of IT.

2. Management is key to technological dynamism. Progressive enterprises scan technological trends, build alliances, experiment, and diffuse best practices throughout the firm. Training, career planning for technical staff, incentives for innovators, and other techniques of
human resources management improve technological capability and remove the hurdle of scarcity of human capital need for acquiring, adopting and using IT.

3. Aid agencies should help governments become effective IT users, build their competence to formulate and manage national IT strategies, and promote IT diffusion throughout the economy. Aid agencies should take a long-term view of the roles and capabilities of the public and private sectors and help create ability to learn and adapt technology. They should promote public-private partnership, and help create local capacity to strategically manage a national process of IT diffusion and learning. Aid agencies may assist public and private collaboration in the design and implementation of IT diffusion programs to improve competitiveness of private enterprises. Priority may be given to SMEs whose viability is likely to depend on effective use of electronic networks and IT applications and overcome the problem of finance for acquiring, adapting and using IT.
4. The state plays important and varied roles in the development and implementation of IT policies and programs in all developing countries. Governments should devise programs to diffuse IT to SMEs and establish more technology parks to attract IT industries. Government should decentralize the planning and management information systems. Centralization reduces flexibility to exploit advances and to orient IT investment to needs. But government should set strategy standards and policies and sponsor demonstration projects and the introduction of best practices in public agencies. The government should set broad directions and priorities of IT application and invest in databases and networks of use across agencies and bring a synergy between firms, universities and technical institutions.

B. Suggestion for Specific Problems:

1. The uncertainty associated with in-house R&D related to new technologies such as IT is particularly high, especially in business environments dominated by short-term profitability considerations.
Indivisibility of research can retard the R&D with its highly uncertain outcome. Hence the study suggests for the firm should long term programmes consideration and made efforts to remove uncertainty as soon as possible.

2. The problem of infrastructure in Karnataka is more pertinent due to poor investment by the government on infrastructure and heavy rainfall and floods which have damaged the roads and power supply of the state. Hence this study strongly suggests for huge investment on infrastructure like road and power with the help of aid agencies, center government by way of public private partnership (PPP). Though this has already started in some projects the speed that which has been implementing is very slow.

3. NASSOM feels that identification of a defensible niche is the first step for a small company to differentiate. In terms of verticals, SME players could target emerging or nascent verticals such as transportation, education, utilities and e-governance. Though a high-risk space, a product play is more suitable for SME as it is
comparatively scale independent. Companies could aim to start with components as opposed to full-fledged product suites. NASSCOM has proposed some initiatives for this segment including.

- Helping SMEs in spotting opportunities by a market intelligence service through identification of new business areas and technologies this information will be mailed to SMEs on a weekly basis.

- Holding niche events in verticals and geographies for SMEs.

- Public Relation effort for SME companies.

- Helping SME companies understand best practices by holding workshops on quality, salary and people practices.

4. The garment-manufacturing firms specially IT non use firms in the study must adopt information technology in order to remain competitive in the world market. Firms may need to undergo the organizational changes and workers may require training to upgrade their skills in order to use IT tools effectively.
5. Government IT diffusion programmes should reward those institute that respond to new technological demands. They bring together IT suppliers, users, and consultants to experiment and adapt. They stimulate the creation of consulting companies within universities, self-financing of applied research and innovation centers among enterprises. Where geographically concentrated, they help create dynamic learning communities. Diffusion requires innovative intermediaries for knowledge transfer. They may include “Private-to-Private” services, nonprofit organizations, among others. Government subsidies for such services often better stimulate demand and demonstrate their benefits than to traditional industrial extension. Though government already started diffusing the IT in secondary cities, efforts are inadequate, therefore, the study recommend for big boost in the diffusion.