CHAPTER IX
SUMMARY AND CONCLUSION

In the present research work an attempt is made to study the structure, performance and competitiveness of the Information Technology Industry in India. As the industry matures, competition heightens and margins tend to decline. In such times technical efficiency, industry competitiveness and global perspective of industry competitiveness are examined to grasp the value of the industry for the country.

9.1 OBJECTIVES OF THE STUDY

The specific objectives addressed are as under:

i. To trace out the factors contributing to the phenomenal growth of Indian IT industry including the role of institutions and government policies.

ii. To study the competitiveness of Indian IT industry by applying the Porter’s Diamond Model.

iii. To determine the drivers of the technical efficiency of the Indian IT Industry by applying Data Envelopment Analysis.

iv. To examine the global competitiveness of Indian IT industry using Data Envelopment Analysis.

v. To carry out SWOT analysis of Indian IT industry for determining the sources of competitive advantage for this industry.

9.2 RESEARCH METHODOLOGY

A sample of 154 firms in the Indian IT industry is studied for the decade 2001-02 to 2010-11. The financial data pertaining to the industry is obtained from the Prowess database published by CMIE. Further, data collected by Global Information Technology Report (GITR) 2010-11, published by World Economic Forum, Geneva, in partnership with INSEAD is assessed to obtain a global perspective of the industry.

The research methodology and design, the specific data issues encountered and overcome and data envelopment models used are summed up in the following flow chart.
Review of Literature

Identification of Input and Output Variables

Data Collection through Secondary Sources
1. Prowess Database
   (Data collected for the ten years 2001-02 to 2010-11 for 154 firms in the Indian IT Industry).
3. Annual Reports of NASSCOM (National Association of Software and Services Companies) and various issues of Strategic Review published by NASSCOM annually.

Data Analysis Techniques Used
1. Data Envelopment Analysis (DEA)
2. Multiple Regression

Data Issues
1. Problem of negative and missing data entries
2. Resolved successfully by affecting translation invariance and the use of the approach proposed by Kusosmanen (2002)

Model Specification
BCC-I, CCR-O and BCC-O Envelopment DEA programs

Software for Computation
1. MAX DEA
2. SPSS (Statistical Package for Social Sciences)
9.3 MAJOR FINDING: INDUSTRY STRUCTURE AND GROWTH

- The industry structure comprises of three broad segments: services; product; and hardware.
- The spectrum of services has widened: IT services; BPO (Business Process Outsourcing); ER & D (Engineering Research and Design) and OSPD (Offshore Product Development).
- ESO (Engineering Services Outsourcing) is the more recent and challenging service provided by the industry to position itself in the most competitive world of information technology, products and hardware.
- The industry consists of a healthy mix of firms – Indian, MNCs and Global Inhouse Centres (earlier called captives). The Indian service providers dominate IT-BPO exports accounting for a share of ~65 percent in FY2011 (NASSCOM, 2012).
- The industry structure is broad-based and pyramidal. Large-sized companies numbering 8 contributed 44-47 percent of export revenues and ~35 percent of total employees, whereas at the bottom of the pyramid >3500 start-ups contributed a meagre 5-6 percent of export revenues and ~15-18 percent of total employees in FY2011 (NASSCOM, 2012).
- The player landscape of ~16,000 firms provided a full gamut of services, viz., IT services, BPM, SMAC, ER&D, software products, OSPD and others contributing USD 118 billion of revenue in FY2014. Industry serviced >25 verticals and marked global presence in 78 countries (NASSCOM, 2014).
- Incessant revenue augmentation characterizes the Indian IT industry. A clear growth trend in both export and domestic industry revenues is witnessed. The export revenues are expected to grow from USD 40.9 billion in FY2008 to ~USD 98 billion in FY2015, an increase of about 140 percent in a short span of 7 years. Domestic revenues are expected to grow from USD 21.9 billion to ~USD 48 billion in the same period registering a growth of about 120 percent.
- The IT-BPM industry is one of the largest organized private sector employer in India. It is expected to contribute ~ 3.5 million direct employment and ~ 10
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million indirect employment in FY2015 (NASSCOM, 2015). The industry is expected to propel direct employment by ~ 78 percent from 1.96 million in FY2008 to 3.5 million in FY2015.

- The industry share relative to India’s GDP grew >6 × in the last 15 years (FY 1998-2013). Industry is expected to contribute ~ 9.5 percent to India’s GDP in FY2015 (NASSCOM, 2015).

- Its share in India’s total exports also grew >6 × times in the last 15 years (FY 1998-2013). Further IT-BPM industry is expected to contribute > 38 percent share of total Indian exports (merchandise plus services) in FY2015 (NASSCOM, 2015).

- Its share in the global sourcing market is visibly strong at 55 percent in FY2015.

- The PE/VC investment in Indian IT industry is expected to exceed USD 6 billion in FY2015.

9.4 MAJOR FINDINGS: APPLICATION OF PORTER’S DIAMOND MODEL TO STUDY THE COMPETITIVENESS OF INDIAN IT INDUSTRY

- To sustain the India brand, the underlying industry structure must be built by strategists on the framework provided by Michael E. Porter in his “Five Forces Model”, and carve out an industry niche less vulnerable to attack by competitors.

- The application of Porter’s Diamond Model (Porter, 1990) to Indian IT industry, the interaction of the determinants of competitive advantage has a deep and transformative effect on the evolving industry.

- India’s competitive advantage is strong in terms of its export, global market share and growth. The export revenues of the Indian IT-BPM industry are expected to grow from USD 40.9 billion in FY2008 to USD 98 billion in FY2015 and increase of about 140 percent in a short span of 7 years. Global market is estimated to grow at 45 percent annually to reach ~ USD 25 billion by 2015. Indian market is estimated to grow from ~ USD 200 million in 2012 to ~ USD 1.0 billion in 2015, a CAGR of ~ 83 percent. India maintained its leadership position in the global sourcing arena. Its market share increased from 52 percent in FY2012 to 55 percent in FY2013. Whereas, the global sourcing market grew by
USD 11-12 billion in FY2013. India accounted for over 90 percent of the incremental growth (NASSCOM, 2013).

- The factor conditions, one of the determinants of competitive advantage envisaged by Porter is strong in Indian context. Labour as a factor source is created and not inherited source of competitive advantage for the Indian IT industry. India has successfully created a future ready digital workforce, with more than 150,000 employees with SMAC skills, ~50,000 employees skilled in analytics, 30,000 people in enterprise mobility and >50,000 in cloud and social medias & collaboration (NASSCOM, 2015). The country has the world’s largest employable pool estimated at 5.3 million in FY2014 with the most diverse skill base and second highest number of English speakers in the world. India continues to lead in cost competitiveness, is 7-8× cheaper than the source locations and 30 percent cheaper than the next nearest low-cost country (NASSCOM, 2014).

- Factor conditions other than labour – finance, infrastructure, technology and R & D were a source of competitive weakness rather than strength in 1980s. This constrained the competitive performance of the industry on the domestic front; whereas these factor disadvantages catalysed innovation – the development of bodyshopping on the export front.

- The transition to offshore and the creation of “offshore development centers” (ODCs) enabled India to keep ahead of new entrants. Approximately 640 ODCs across > 78 countries have catalysed business transformation for global clients (NASSCOM, 2015). The time zone difference has further brought significant competitive advantage to the industry.

- To bring about sustainable competitive advantage, government allocation of over USD 1 trillion investment (2013-17) on infrastructure front (NASSCOM, 2013) is commendable.

- Unlike Porter’s Model, the great leap in Indian IT industry did not begin with domestic demand. India emerged as a viable outsourcing destination. The opportunities created by the millennium bug and Euro-currency conversion opened doors for Indian firms. It is in FY2015 that domestic market is set to grow faster than exports market at 14 percent, driven largely by the addition of e-
commerce, to reach USD 48 billion. Home demand can hence bring greater competitive advantage to Indian IT industry.

- The third determinant in Porter’s Diamond Model, the related and supporting industries which enhanced industry competitiveness largely were the education industry followed by the telecommunication industry. The hardware industry did not contribute enough to the competitiveness of Indian IT industry but the software work of hardware companies made significant contribution.

- The fourth determinant envisaged by Porter in his Diamond Model is firm strategy, structure and rivalry. The competition in the Indian IT industry has not fostered the kind of factor/quality improvements or new product/process developments that Porter envisaged.

9.5 MAJOR FINDINGS : DRIVERS OF TECHNICAL EFFICIENCY OF INDIAN IT INDUSTRY

- Average technical efficiency of the sample of 154 Indian IT companies for the decade 2001-10 is placed at 59.49 percent.
- The number of efficient firms in the Indian IT industry stood at 46 in the year 2010. It more than doubled at the close of the century.
- Three well managed companies were identified, viz., Concurrent (India) Infrastructure Limited, Infosys Technologies Limited and Wipro Limited who stayed consistently at the efficiency frontier throughout the time period investigated.
- There were 66 companies who never reached the efficiency frontier in the decade studied.
- The average efficiency score of 92 DMUs for the decade 2001-10 remained below the industry average score of .5949.
- The reference or the peer set of 154 Indian IT companies for the year 2010 is enumerated. The management practitioners can elicit useful information from this table. The inefficient DMUs learn about the efficient DMUs whom they must emulate to improve efficiency.
The peer frequency of efficient DMUs which test the robustness, strength and vigour of DEA results is studied over the decade. Some efficient DMUs in each of the year studied had a peer frequency of zero. Their efficiency hence becomes questionable. The truly efficient DMUs lag behind in each year studied except 2009. The number of truly efficient companies have gone up from 20 to 33, a little more than 50 percent. It can lead us to conclude that companies in the industry may have sacrificed efficiency for growth. Yet, the number of truly DMUs has an increasing trend and the Indian IT industry can continue to flaunt its superiority.

YoY list of efficient DMUs who were not peers have also been prepared. The fact that the same efficient unit has not faltered repeatedly shows that the industry has not lost drive or effectiveness.

Further the radial and slack movement required to push the reference DMU which is inefficient onto the frontier formed by the efficient DMUs is furnished for the year 2010. This information is of immense use to management practitioners.

9.6 MAJOR FINDINGS : GLOBAL COMPETITIVENESS OF INDIAN IT INDUSTRY

India’s performance across 138 nations of the world is assessed using Global Information Technology Report (GITR) 2010-11. India’s Networked Readiness Index rank is placed at 48.

India’s rank by component and pillar in GITR 2010-11

<table>
<thead>
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<th>Environment</th>
<th>Market</th>
<th>Political and Regulatory</th>
<th>Infrastructure</th>
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<td>4</td>
<td>52</td>
<td>81</td>
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<th>Readiness</th>
<th>Individual</th>
<th>Business</th>
<th>Government</th>
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<td>33</td>
<td>21</td>
<td>33</td>
<td>47</td>
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<table>
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<tr>
<th>Usage</th>
<th>Individual</th>
<th>Business</th>
<th>Government</th>
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<tr>
<td>67</td>
<td>98</td>
<td>45</td>
<td>47</td>
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To study the maximization of ICT usage of selected nations (138) the BCC score using output oriented model of Data Envelopment Analysis (DEA) is computed.

India’s score, Benchmark and Peer Frequency.

<table>
<thead>
<tr>
<th>DMU</th>
<th>DEA Score</th>
<th>BCC Rank</th>
<th>Benchmark/Reference Set (Lambda)</th>
<th>Times as a benchmark/peer for another DMU</th>
</tr>
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<tbody>
<tr>
<td>India</td>
<td>0.741773</td>
<td>120</td>
<td>Bolivia(0.397906); Korea, Rep.(0.602094)</td>
<td>0</td>
</tr>
</tbody>
</table>

The average technical efficiency of nations is .8337414.

Nations with an efficiency score of one are five in number. These are Bolivia, Chad, Korea Republic, Spain and Timor-Leste. Korea Republic’s benchmark frequency of 130 is incredible!

The scale efficiency of nations have been found. India’s scale efficiency is placed at 92.97 percent and has a chance to grow under increasing returns to scale. If its technical efficiency (.741773) is pulled up, India can remain in the phase of increasing returns to scale or a longer period and outshine its competitors around the world.

Korea Republic is the sole nation operating at the Most Productive Scale Size (MPSS) with the scale efficiency of unity.

Regressing ICT usage on technical efficiency, environment and readiness indices $R^2$ value of .969 is obtained. Hence 96.9 percent variation in the dependent variable, that is ICT usage is explained by all the independent variables in the model.

All three predictor variables are significant (each with the $p$ value of .000) at 1 percent and are thereby good explanatory variables of the dependent variable ICT usage.

The regression coefficients of the predictors are positive signifying that with every unit increase in predictor variables ICT usage shall improve.

Further, one unit of increase of technical efficiency improves usage by 3.218 units the others predictors remaining unchanged. Likewise, a one unit increase in
environment index bring a .638 unit improvement and a one unit increase readiness index bring a .598 unit improvement in the dependent variable usage.

- Technical efficiency does not correlate favourably with environment \((r = .096)\) and readiness \((r = -.064)\) both. Further these values are not significant at 5 percent level. It hence leads us to conclude that technical efficiency shall improve with factors other than increased ICT environment and readiness. It remains imperative for nations to push up technical efficiency since its impact on usage is tremendous \((3.218)\) as seen from the regression coefficient.

### 9.7 MAJOR FINDINGS: SWOT ANALYSIS

- The major strengths of the Indian IT industry are its strong fundamentals, enabling environment and enhanced value delivery. The global footprint is expanding. Focus of cost mitigation and improvement of operating metrics is strong. The widening employee pyramid and stable entry level salaries keep labour cost in check.

- Counting on India’s weaknesses, the gaps in basic supporting business infrastructure (road/air connectivity, mass rapid public transport system etc.) are seen. India ranks low on internet bandwidth and internet users. Though Indian IT industry is moving up the value chain, product development remains low. Bureaucracy continues to limit industry attractiveness.

- The prevailing global mega trends – macroeconomic, demographic, social, environmental, business and technology – present new opportunities for the Indian IT industry. The new and emerging services and verticals (such as manufacturing retail, healthcare, government and utilities) and the continued stronghold over core services (banking, financial services and insurance) are expected to drive the next phase of IT industry growth. Diversification to emerging geographies (Asia-Pacific, Latin America, Eastern Europe, the Middle East and Africa) and retaining the leading markets (US, UK and Continental Europe) provide an abundant and unmatched opportunity. Of late, the
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government’s economic growth agenda, driven by the vision of technology-enabled digital India is expected to augment opportunities.

- The key threats to the Indian IT industry are wage inflation, rapid change in technology and cannibalisation of existing services due to new technologies, increase in infrastructure development costs, discontinuation of fiscal incentives, the volatile exchange rates, recession, rise of protectionism, high taxation and not too favourable political and legal environment in source locations.

- A SWOT analysis of key global source locations enable us to conclude high attractiveness of the Indian IT-BPM industry. The necessary activity to sustain this attractiveness remains the continuous supply of skilled labour. At the same time building and executing a beyond arbitrage proposition geared toward higher margin value added services is imperative. For maximum leverage the arbitrage proposition should continue to be protected.

9.8 IMPLICATIONS OF THE STUDY

To maintain India’s competitiveness as the foremost outsourcing destination improvement in the technical efficiency of the industry is imperative. The findings of the present study shall enable the management practitioners to formulate appropriate strategies to improve operational excellence. By emulating the benchmark DMUs, industry can achieve the next level of growth and efficiency. The utility for managers shall be enhanced when efficiency score improves. It will help build the confidence in Indian IT industry, in particular and also in India as a business destination par excellence.

9.9 SUGGESTIONS FOR FUTURE RESEARCH

To further assess the operational efficiency and changes in productivity of the firms in the Indian IT sector, post-DEA analysis can be made. Since we have time-series data, the results of DEA can be studied in conjunction with Malmquist Productivity Index (MPI). In the present situation when data is negative (RONW), efficiency scores
can be computed through the RDM model (Portela et al., 2004), that provides radial equivalent measures of efficiency when some data are negative. Then these DEA indices can be used to compute Malmquist Index. It is further suggested, that the Malmquist Index approach developed by Portela and Thanassoulis (2008) for non-negative, where circular index for productivity change is computed by recourse to a meta-frontier can be used. This can further enhance the utility of the present study for management practitioners.