CHAPTER 6

CONCLUSIONS AND FUTURE RESEARCH

This study has evaluated the operational efficiency of Indian airports by selecting 17 International airports which offered domestic services during the period from January 2011 to December 2011 and provide solutions to efficient management of airports. This study is helpful to contribute to the theoretical aspects of the benchmarking and service quality concepts as well as providing implications for managers and policy makers of airports in India.

6.1 FINDINGS AND CONCLUSIONS OF AIRPORT BENCHMARKING

The following three aspects are the important outcomes of research objectives using DEA namely

i) Theoretical Perspective

ii) Managerial Perspective

iii) Policy Makers Perspective

6.1.1 Theoretical Perspective

1. The airports in Mumbai, Bangalore and Goa form the frontier according to DEA-CCR model. These three airports are optimal airports. These optimal airports form the benchmark for other less efficient airports in India.
2. For less efficient airports in Ahmedabad, Amritsar, Calicut, Chennai, Cochin, Delhi, Guwahati, Hyderabad, Jaipur Kolkata, Nagpur, Port Blair, Srinagar and Trivandrum should select appropriate airports from Mumbai, Goa or Bangalore to follow their best practices in order to become efficient airports.

a. The Benchmarking airport set for Ahmedabad is only Mumbai. For the airport in Ahmedabad to become globally technically efficient, it can learn best practices from the Mumbai airport.

b. The Benchmarking airports set for Amritsar are Mumbai and Bangalore. For the airport in Amritsar to become globally technically efficient, it can learn best practices from Mumbai and Bangalore airports.

c. The Benchmarking airports set for Calicut are Goa and Mumbai. For the airport in Calicut to become globally technically efficient, it can learn best practices from Goa and Mumbai.

d. The Benchmarking airports set for Chennai are Mumbai and Bangalore. For the airport in Chennai to become globally technically efficient, it can learn best practices from Mumbai and Bangalore.

e. The Benchmarking airports set for Cochin are Mumbai and Bangalore. For the airport in Cochin to become globally technically efficient, it can learn best practices from Mumbai and Bangalore.

f. The Benchmarking airports set for Delhi are Mumbai and Bangalore. For the airport in Delhi to become globally
technically efficient, it can learn best practices from Mumbai and Bangalore.

g. The Benchmarking airports set for Guwahati are Goa and Mumbai. For the airport in Guwahati to become globally technically efficient, it can learn best practices from Goa and Mumbai.

h. The Benchmarking airport set for Hyderabad is only Bangalore. For the airport in Hyderabad to become globally technically efficient, it can learn best practices from Bangalore.

i. The Benchmarking airports set for Jaipur are Goa and Mumbai. For the airport in Jaipur to become globally technically efficient, it can learn best practices from Goa and Mumbai.

j. The Benchmarking airports set for Kolkata are Goa and Mumbai. For the airport in Kolkata to become globally technically efficient, it can learn best practices from Goa and Mumbai.

k. The Benchmarking airports set for Nagpur are Mumbai and Bangalore. For the airport in Nagpur to become globally technically efficient, it can learn best practices from Mumbai and Bangalore.

l. The Benchmarking airports set for Port Blair are Goa and Mumbai. For the airport in Port Blair to become globally technically efficient, it can learn best practices from Mumbai and Goa.
m. The Benchmarking airports set for Srinagar are Goa and Mumbai. For the airport in Srinagar to become globally technically efficient, it can learn best practices from Goa and Mumbai.

n. The Benchmarking airports set for Trivandrum are Goa and Mumbai. For the airport in Trivandrum to become globally technically efficient, it can learn best practices from Goa and Mumbai.

3. Out of 17 airports in India, only 3 airports namely Mumbai, Bangalore and Goa have achieved 100% global technical efficiency. But the remaining 14 airport’s global technical efficiency is less than 100% which is due to lack in pure technical efficiency or scale efficiency or both. So there exists a large scope for improvement of airport performance in India.

4. The global technical efficiency score in India airports ranges between 5.5% to 100%, with an average of 50.5%. Thus, the level of global technical inefficiency in Indian airports is about 49.50%.

5. The analysis of frequency distribution of global technical efficiency score reveals that only 4 airports namely Mumbai, Bangalore, Goa and Chennai have efficiency score above 80%. This indicates that other airports need to develop a suitable policy to improve the utilization of available infrastructure, which has an impact on the efficiency of the airports.

6. Most of the airports (70.59%) in India such as Ahmedabad, Amritsar, Calicut, Chennai, Cochin, Guwahati, Jaipur, Kolkata, Nagpur, Port Blair, Srinagar and Thiruvananthapuram exhibit
increasing returns to scale. The average pure technical efficiency of the airports is 69.30%. This indicates that the airports in India operate at a moderate pure technical efficiency and exhibit an increasing return to scale.

6.1.2 Managerial Perspective

1. The Indian Airports are classified into four categories based on i) working at optimum efficiency ii) pure technically efficient but lacking in scale efficiency iii) lacking in technical efficiency and iv) lacking in both scale and technical efficiency.

a. The airports in Mumbai, Bangalore and Goa are optimal airports. These airports are used as the frontier or benchmarking airports. These airports would operate at maximum level to extract the full potential of their resources.

b. The airports in Calicut, Chennai, Delhi, Guwahati and Jaipur are pure technically efficient but lack in scale efficiency. This could be improved by developing specific policies aimed at scale up operations for airports in Calicut, Chennai, Guwahati and Jaipur and scale down operations for airport in Delhi.

c. The airports in Amritsar, Hyderabad, Kolkata, Nagpur and Srinagar whose pure technical efficiency could be improved by developing specific policies aimed at making better use of currently unused resources.

d. The airports in Ahmedabad, Cochin, Port Blair and Trivandrum are poor in both scale and level of pure
technical efficiency. Therefore these airports need to focus in both improving the technical and scale efficiency.

2. Of the seventeen airports, eight of them, namely, Bangalore, Calicut, Chennai, Delhi, Goa, Guwahati, Jaipur, and Mumbai have been identified as relatively efficient under VRS assumption. They attained pure technical efficiency equal to 1.0. Out of these eight airports, 3 airports namely Bangalore, Mumbai and Goa were relatively efficient under CRS assumption with global technical efficiency score equal to 1.0. For the other five airports namely Calicut, Chennai, Delhi, Guwahati and Jaipur, the global technical inefficiency is caused entirely by scale inefficiency. It indicates that these airports must focus on the scale of operations for improvement.

3. The airports in Bangalore, Goa, Mumbai and Hyderabad operate in constant returns to scale. These airports operate at most productive scale size. Out of these airports, 3 airports namely Bangalore, Mumbai and Goa are optimal airports. For the airport in Hyderabad, the global technical inefficiency is caused entirely by pure technical inefficiency. It indicates that these airports may focus on technical operations for improvement.

4. The airport in Delhi operates in decreasing returns to scale. It indicates that when a percentage increases in inputs, it produces a lesser proportional expansion of outputs. The global technical efficiency of Delhi airport would improve by downsizing the scale of operations. The airports in Ahmedabad, Amritsar, Calicut, Chennai, Cochin, Guwahati, Jaipur, Kolkata, Nagpur, Port Blair, Srinagar and Thiruvananthapuram operate in the
area of increasing returns to scale. This indicates that a percentage increases in inputs produces more than proportional expansion of outputs. These 12 increasing returns to scale airports are likely to experience economics of scale when their output increases in the long run. The efficiency of these airports would improve by expanding the size of their scale of operations.

6.1.3 Policy Makers Perspective

1. The efficient target for passengers’ movement in less efficient airports such as Ahmedabad, Amritsar, Calicut, Chennai, Cochin, Delhi, Guwahati, Hyderabad, Jaipur, Kolkata, Nagpur, Port Blair, Srinagar and Trivandrum may have to be improved.

2. The efficient target for aircraft movement in less efficient airports such as Ahmedabad, Amritsar, Calicut, Chennai, Cochin, Delhi, Guwahati, Hyderabad, Jaipur, Kolkata, Nagpur, Port Blair, Srinagar and Trivandrum may have to be improved.

3. The less efficient airports may consider the following suggestion to fix the efficient target of aircraft movements and efficient target of passenger movements to become efficient airports:

   a) Airports may provide necessary infrastructure for operation of new airlines so that new airlines do not have to incur capital expenditure

   b) Facilitation at airports in coordination with India Tourism for increasing airports passengers’ movements
c) Airports may provide special lounges on demand of respective airlines on chargeable basis

d) Discount on landing and parking charges on the existing rates as an incentive for first three year of schedule operations

e) Discount on Navigation charges on the existing rates as an incentive for the first two years of schedule operations

f) For selected inefficient airports which are related to tourism, religious place, state capitals, industrial/ business centres, a special discount on landing and parking charges for two years of schedule operations

g) Airports try to make maximum utilisation of the non-peak hours. Effective slot coordination between airlines and airports is one of the most important ways of mitigating this issue. Further airports can initiate the following measures:

i. Special Incentive to the airlines for landing and flying at non-peak hours

ii. Running promotional campaign directly for passengers travelling during non-peak hours such as free bus services and discount at retail stores

iii. Short duration flights or regional should be slotted during non-peak hours

The above information could be useful for policy makers in airport sector and airport managers to improve the less efficient airports in the right direction. This could be done by analysing each less efficient airport and by
increasing the number of aircraft and passengers movements to become optimal airports.

6.2 FINDINGS AND CONCLUSIONS OF AIRPORT RANKING

This study has been made to conclude the Ranking of four metro airports in India. The following two aspects are the important outcomes of research objectives using AHP namely:

a) Relative weights of major criteria and its sub-criteria
b) Ranking of four metro airports

1. The relative weights of Physical Amenities have the highest relative weight than service quality and then airport performance for evaluating the airports.

2. From the analysis it is found that the major criteria Physical Amenities have more influence on the evaluation of the airport. Further, the sub-criteria of these three, namely Passenger Comfort, Intra & Inter-Terminal Transport and Information Display play a role in the evaluation of the airports. So, by concentrating on these aspects, the airport management can aim at the modernization and adaptation of these facilities to meet the user’s demand.

3. Next, Service Quality criteria also influence on the evaluation of the airport. The sub-criteria of these three, namely Service cape, Staff Courtesy and Service Accessibility play a role in the evaluation of the airports. With this, airport managers can choose the best direction towards improving passenger acquisition and retention.
4. Then airport performance criteria also influence on the evaluation of the airport, the sub-criteria of these three, namely Security Process Time, Safety Record and Baggage Delivery plays a role in the evaluation of the airports. With this, airport managers can choose the best direction towards improving performance of the airport.

5. Airport in Delhi is best in India among the four major metro airports such as Mumbai, Chennai and Kolkata

6.3 FINDINGS AND CONCLUSIONS OF AIRPORT SERVICE QUALITY MEASUREMENT

This study has been made to conclude the Service Quality Measurement of airports in India and finds a direction for strategic thinking about airport service quality in following ways.

1. This study provides a modified scale for measuring passengers’ perception of airport service quality for developing countries especially India

2. Established the number of dimensions (factors) of perceived service quality in the airport industry for developing countries especially India

3. Tested the reliability and validity of the modified scale

6.4 LIMITATIONS OF THE STUDY

1. In the DEA in airport study, there are many types of inputs, desirable outputs and undesirable outputs for evaluation of airport efficiencies. The input measures in this study are limited to the airside operations only. The output measures in this DEA
study are limited to desirable output such as the passengers and aircraft movements only.

2. DEA-CCR and DEA-BCC are the basic models used in this study. In future study, more advanced DEA models could be used.

3. This study applied survey instrument to measure the passengers’ perceptions of service quality with respect to airport services in Chennai airport. The same study can be extended during other seasons such as summer in Chennai airport for generalising the study.

6.5 SCOPE FOR FUTURE WORK

This research pioneers the work on the assessment of productivity of airports operating in India as well other developing countries. It opens up new opportunities for aviation researchers and practitioners to better understand the relation between inputs and outputs of airport operations. There are several potential extensions to this study that could be conducted in the future. Some of them are suggested here.

i) Consideration of Comprehensive Input and Output Measures: An attempt may be made to collect other inputs and output measures and take them into consideration for assessing the productivity of 17 Indian airports. The input measures in this study may be rather limited to the airside operation. In fact, one may want to see how other capital inputs such as the number of gates, terminal area, and apron area could impact the productivity of airports. Financial inputs are also important for airport operations.
Environmental factors such as population density, accessibility, and market conditions also have a significant impact on traffic volume which in turn affects productivity of airport operations.

On the undesirable outputs, such as delays, mishandled baggage and accidents could impact the productivity of the airports.

ii) Application in the International Context: It will be very useful if one can extend the study framework to assess productivity of airports in the global context so that the valuable lessons may be learned from globally efficient airports, rather than benchmark among Indian airports only.

iv) Better Understanding of Factors Affecting Productive Efficiency: Many studies have focused on assessing productivity, but relatively few paid attention to the development of prediction models. More research effort may be put forth toward the development of casual models for explaining variations in airport productivity. Such models will enable the managers and policy makers to better understand the factors that can enhance operational efficiency.

v) Airport service quality study may be applied to other Indian airports as well as other developing countries to generalise the findings.
6.6 CONCLUDING REMARKS

Airport industry benchmarking study has come into acceptance in the last 15 years, particularly as many airports moved from direct public sector control to autonomous authorities. The airports in Mumbai, Bangalore and Goa form the frontier and form the benchmark for other less efficient airports in India. From the AHP analysis, the relative weights of Physical Amenities have the highest relative weight than service quality and then come airport performance for evaluating the airports. Findings clearly indicate that Airport in Delhi is best in India among the four major metro airports such as Mumbai, Chennai and Kolkata. This service quality measurement study provides a valid and reliable scale for measuring passengers’ perception of airport service quality for developing countries. This study also contributes to airport services quality management by identifying the key role of Effectiveness, Efficiency, Productivity, Interaction and Décor in the competitive landscape of the airport industry. Five sub-dimensions are highly suited for measuring service quality in airports. The outcomes of the study would help to contribute to the theoretical aspects of Benchmarking and Service Quality concepts as well by providing implications for managers of airports in India.