

CHAPTER-2

REVIEW OF LITERATURE

=====

This chapter deals with the review of literature which is related to the transport sector. The review of literature is categorized in three sections, in first section the review of literature includes those papers which are related to the global context. Second one includes papers which are of Indian context. In last section some reports are reviewed which are very important for current study.

2.1 Global Context

Alzydas Balzentis and Tomas Balenzentis (2011) conducted a study to analysis Lithunian Transport Sector by applying multi criteria decision making methods MULTIMOORA and Data Envelopment Analysis. Both are used for technical and scale efficiencies. MULTIMOORA provides final ranking (Brauers and Zavadskas 2006) without any additional information. Here DEA is used for measuring the relatively efficiency of a Decision Making Unit. With help of ratio system of Moora Data normalized and every ratio is given the rank. But MULTIMOORA technique does not gave appropriate results. DEA calculating technical efficiency by using various model and suggest that if there is technical modernization of the Transport Sector than it leads to technical efficiency. The technical efficiency was not achieved but scale efficiency was achieved by public transport of Lithunian. For strategic decisions study played a significant role. It is observed that if the resources are properly utilized than the public transport could be achieved the technical as well as scale efficiency.

Jorda et al., (2012) evaluated the technical efficiency of urban bus companies in Spain for the period from 2004 to 2009 with the help of using SBM (slack based measures) the empirical part of this study established some slacks in service of transport. The exogenous variables are also taken for the analysis of the performance. Slacks are used as exogenous variable which accredit for simply studies the inefficiency of DMUs operating conditions. For regression, socio-economic variables also appear. The value of r calculated and it was observed that this value is not very high. SBM helped to capture the impact of actual slacks on efficiency scores of various DMUs. SBM directly deals with the output and input slacks.

Kolawole et al., (2014) analyzed the service quality and the satisfaction of customer of Ghana Public Transport. To measures the customer satisfaction SERVQUAL model has been used. SERVQUAL model be made up of 5 elements which are assurance, empathy, tangibility and responsiveness. This paper mentioned that usually there are two methods which are using to measures the service quality of public transport one is SERVQUAL, also called Gap Analysis Model (Parasuraman et.al, 1985, 1988) and second is Perceived Service Quality (Gronroos, 1984). Here SERVQUAL method was used and on the basis of the above five elements of this model some attributes has been taken. With help of these attributes, study reveals that more than half of these attributes does not satisfy the respondents. This study also revealed the gap between the perception of service quality and customer satisfaction for a government funded and a private operator.

Boujelbene and Derbel (2015) defined some issues and challenges in transport sector which has to be improved for better performance by solving basic problems such as atmospheric pollutants, imbalances in transport services, congestion of cities and declined share of public transport. In order to sort out the above problems that affect the public transport and to measure the

performance of the public transport some important criteria were selected which include Economic criteria, Efficiency criteria, Effectiveness criteria and Quality criteria. Here AHP (Analytic Hierarchy Process) has been used for quantitative results. AHP is a process which is used for multi criteria decision making for decision maker who faces a complex structure with many criteria. In this paper various hierarchical levels determines and it was cleared that all the criteria which has been discussed above are very important for MCDM. AHP was developed by Prof. Thomas in 1970s for solving complex decision making process. AHP make use of ranks to calculate the effectiveness and efficiency for various decision making units. Results shows that the regional companies do not used their full capacity. The actual capacity of public transport is very far from its potential capacity.

Allmohammadlou, (2017) checked out the efficiency scores for the colleges in Shiraz University. In term of data it was descriptive case study and overall it is an applied research. Shiraz University includes 14 colleges however two colleges have not proper technology, they are excluded in thus study. For measuring the efficiency two methods adopted first was DEA Window analysis and second one was double frontier. DEA Window calculated the efficiency scores of colleges which are in penal data. Final results revealed that DEAW and Double Frontier provided more accurate result.

2.2 Indian Context

Bhagvath, (2000) tried to measure the efficiency of Decision Making Units. In this study for measurement of technical efficiency of STUs, the data of forty four Indian STUs has been collected. DEA methodology has been adopted in this study. It includes various inputs and outputs. Set of input and output variables from State Transport Undertakings has been taken for

evaluation. Technical efficiency scores were computed both under CRS and VRS assumption. Under VRS model it was found that on an average there must be 10.6% reductions in inputs for existing level of output. Similarly the CRS model reveals that there should 16.6% reductions in inputs for became full efficient DMUs. Scale efficiency is the ratio of the OTE and PTE, the efficiency score observed 93.4%. Conclusion of study is that only eight STUs have unity scale of efficiency score it means that only eight STUs are efficiently working and they operated at most productive scale size. Further stated that, to test the stability of the results obtained, a few efficient STUs were deleted and again efficiency scores were computed and the results are found to be stable. One important thing is captured, that STUs which are working as companies shows better efficiency scores than other STUs. Kumar and Venkatesh (2004) explained that there is huge disparity in technical efficiency over the STUs. Some STUs are performing in an efficient manner than others. The efficiency score of STUs shows that there is need of a regulated environment. For measuring efficiency score of STUs Stochastic Frontier Analysis and cross sectional data has been used. The technical efficiency range was estimated 56.15% to 98.99%. These indicate major differences between STUs performance and efficiency. Average technical score also calculated with Stochastic Frontier Analysis which shows that the average technical efficiency score was 84.22%. It means that there is need of reductions in inputs by 15.88%. And major results found that on the basis of OTE and TE there were three STUs which are performing in efficiently and three which are inefficiently worked.

Bishnoi and Sujata (2010) tried to explain relative efficient and inefficient STUs and set some benchmarks for inefficient efficient STUs and also suggest some different actions that would make inefficient STUs in efficient STUs. According to CRS efficiency score rank given and compare STHAR with other STUs. Technical and pure technical efficiency measured by CRS-

Model and VRS-Model and results showing that only one STU (STHAR) have maximum degree of efficiency. CCR (constant return to scale) model has been used for calculation the overall technical efficiency and BCC (variable return to scale) model has been used for measuring the technical efficiency. With the overall technical efficiency scores and the pure technical efficiency scores scale efficiency has been calculated. Lower the technical efficiency scores for a STU, higher the scope for it to reduce inputs for same level of outputs. With the help of calculating overall mean Technical Efficiency measures how much inputs should be reduced for same level of outputs.

Sexena and sexena (2010) focused on the performance analysis of public road transport. Twenty five STUs has been taken in this study, it was observed that only few DMUs are efficient other are inefficient. Through Data Envelopment analysis it is not possible to provide any method for attaining efficiency but it could help for find out that changes which are needed to be change for became efficient. It was captured that the score of scale efficiencies was greater than the score of pure technical efficiencies, it means that the STUs are technical inefficient and on overall scale they are worked efficiently. There should be changes on technical part for making them efficient. After the PTE, OTE and SE, ANOVA table used for find out the variations of scores in their scores. Through P value it was concluded that there is not very noteworthy variations in scores of these models.

Agarwal et al., (2011) estimates the impact of slacks on efficiencies of STUs. New Slack Model Data Envelopment analysis used which enlarge the radical measures with the actual impact of slacks on efficiency scores. All input and output variables are fully utilized in performance assessment of Decision Making Units. Results suggest reference set for every inefficient region that can be used as a standard for improving the performance of inefficient region.

Singh and Raghav (2014) measured Total Factor Productivity by using multilateral index which proposed by Christensen, Caves and Diewert (1982). Input indices and output indices used for measuring the CAGR of STUs. Here general productivity and Total Factor Productivity measured with using index numbers for STUs. Firstly Total Factor Productivity and Partial Factor productivity has been calculated. Then spot the linkage between prices, productivity and its profitability. After calculated Total Factor Productivity observed the variation in the variables which was beyond the managerial control. For ranking of each DMUs, Kendall's index has been used. From the analytical part of paper it was observed that there was a wide inconsistency between the STUs. Positive relation appears between the size of STUs and Total Factor Productivity. But in statistically terms there was no relation between the size of DMUs and productivity efficiency. Regression has been calculated, and the value of R shows that it was decreasing over the time. From the score of TFP growth rate, STUs divided in to four different categories. In first category includes four STUs which having very high growth rate of productivity. In second, one STU faced decreased in its productivity. Third, no decline in productivity of STUs. In last includes those STUs which showing economic profitability.

Agarwal et al., (2014) focused on sensitivity analysis to find out the robustness of UPRTC. Area of this study covers 15 regions of Uttar Pradesh. For calculating the toughness of DMUs, efficiency scores which are measured by DEA has been taken. This analysis is very helpful in finding the solution that how sensitive the efficiency score and solution values of every DMUs. The NSM (New Slack Model) of DEA was used for measured the sensitivity analysis. Ranking system also applied here for providing ranking to each region according to their efficiency scores. This study reveals that among 15 regions only Ghaziabad and Bareilly regions which are relatively more efficient than others regions. Both regions are chosen for benchmarking. For

making other region efficient, reference set has been made and find out the relatively efficiency of each region. However both Ghaziabad and Bareilly are efficient but the ranking system shows that Ghaziabad was more efficient than Bareilly. In efficient DMUs are not sensitive as efficient regions. The value of R shows that there are 98.8% of variations in outputs due to change in its inputs. The value of F of regions also shows significant results.

Raoniar and Senathipathi (2015) discussed various types of methods which are used for performance evaluation of the public transport. SERVQUAL model is the easiest way to check the service quality of transport but due to inconsistency in the results which are getting this model was not satisfactory. The IPA and CSI models has been used for better results but both techniques are enable to finding the impact of attributes on its performance and transport quality, for the solution of this type of problem ANN and Fuzzy inference modeling could be used. One more technique explained here that is SEM which deals with quality and customer satisfaction in pragmatic manner.

Agarwal, S. (2016) study evaluated the efficiency and effectiveness of Indian STUs by using Data Envelopment Analysis approach. Average technical efficiency calculated with the help of DEA approach. The result of average technical efficiency shows that on an average STUs can reduce it resources and increase output to become efficient. In this paper technical efficiency and effectiveness of STUs has been calculated, first they individually calculated after that estimated combined outcome of efficiency and effectiveness of STUs. Combined result of both shows that if in combined result of a STU, it is efficient than it is not important that it is technical efficient and effective with single and different outputs. Result shows variation between technical efficient scores and effectiveness scores of STUs Patel (2017) made an absorbing attempt to recognize the current demand in the transport sector and identify the investment slant. This study

reveals that changes in climate affects the investment perspective. The summary of study concludes that in India every mode of transportation needed a high potential for investment. This paper also focused on some major challenges faced by roads, like natural challenges (energy, pollution) and industrial barriers like infrastructure, exploded of industries and labor policy. The growth rate of motorized vehicle during last decades was 10%, 12% growth was captured in freight transport.

Kumar (2017) primarily focused on urban transport in Indian cities. This study provided a recap section of transport in urban cities. There are various challenges and issues in front of urban transport. The share of public transport has been declined in last few decades, and the growth rate of private vehicles has been increased. Public transport was not able to fulfill the transport demand of people, because the well-regulated transport system is available in few cities. Due to overcrowding problem of public transport people shift their demand from public to private vehicles. Increase in income of urban population was another cause of shifting the demand of transport. The adverse impact of increased demand of private vehicle created environmental problems, congestion and traffic accidents.

Kumar (2017) focuses on the Indian Bus Industry since independence. Transport industry dominated by State Transport Undertakings (STUs). From the Performance Statistics of STUs result shows that over the years STUs faces huge financial loses. They are unable to keep pace with the rapid and substantial demand of Public Transport. The service quality has deteriorated. The market share also reduced as passengers and they have turned to personalized transport. In current scenario it observed that there is no proper usage of financial resources by the STUs. One important issue is also revealed here that is lack of competitive market. STUs behaving in

monopoly there is no price regulation. For better performance competitive market should be prevails.

Jain and Dhiman (2018) primarily focused on control system of Haryana Roadways. To find the working condition of controlling system for the Haryana roadways Simon's four model of control has been used. The working condition of public transport was not well, there is need for a strong organization structure. There is always seems a gap between actual and potential strategic implementation. Through the descriptive research and with the help of secondary data growth rate measured of Haryana Roadways. Through this performance analysis it was observed that there are various factors which are responsible for bad status of Haryana Roadways. Among these factors, some factors are internally effects the working condition of Haryana Roadways. This study suggests that there should be focus on recreational facilities for workers and some motivational speeches for improvement in productivity. For better supply and demand coordination of transport services, it is important that continuity in services and efficient networking of public transport. Some important suggestions out from this paper, like for efficient working of transport system it is necessary the coordination among various working departments and some sports activity for removing distress level and workers participation should be applied in organization. The efficiency of public transport depends on internal as well as external factors, these are uncontrollable by the managers. For motivation of employers rewards should be given in monetary terms it will improve worker financial condition. One very most important problem discussed in this paper that is inequality of wages for regular and contractual workers. This inequality creates improper behavior among workers. There should equal wage policy for same kind of worker no matter they are contractual or regular.

2.3 Reports

Transit Cooperative Research Program (TCRP) report 88 (2003) recommends the Public Transport in their decision making procedure. Report suggested that for perfect performance measurement system Public Transport should follow a step by step process. It also reveals that there are some major indicators which are decide the performance of Public Transport. Indicators divided into ten categories these are as follows- Availability, Travel time, Safety and security, Maintenance and construction, Economic, Capacity, Service delivery, Community, Para-transit, Maintenance and construction, Comfort. With the use of these indicators the performance analysis of Public Transport can be evaluate.

Annual Administrative Report of Transport Department, Haryana (2005) was the 40th annual administrative reports of Haryana roadways. Primarily focused of that report was on the commercial wing of Haryana Roadways. During 2005-06 for healthy performance of Haryana roadways there 564 new buses were replaced for old buses. As compare to 2004-05 the total expenditures were increased by around 73 crores and total receipt also increased by 37 crores. In 2005-06 the Haryana roadways worked efficiently. It provided descriptive figures and data for annual year 2005.

India Transport Report (2013) focused on long term policy of Indian Transport, moving to 2031-32. It provides a framework for future development in transport sector. Transport sector facing many problems which are creates hurdled in its growth and development like casualty, timeliness, skills, human resources, good governance, pricing and funding. This report provides the solution of this type of problems. Report reveals that investment should be increased to 30 trillion by 2031-32. In 12 five year plan the growth rate was 7% it also needed to be increased to

9% by 2031-32. All public modes of transport are very important for overall growth and development of a country. In every mode of transport rail transport, air transport, road transport and port transport need investment.

2.4 Research Gap

It is found that most of the earlier studies have explained the financial and physical performance Indian STUs by using various tools and techniques and they have also measured their efficiency and effectiveness. Present study rigorously focuses on the depot level efficiency and trend pattern of Haryana Roadways. The technical efficiency of Haryana State Transport Undertaking is better than others STUs (Sujata 2010), but the study has covered data upto 2006-2007. But Haryana Roadways has undergone tremendous changes after the FY 2006-2007. This study covers the sixteen years data of Haryana Roadways from 2001 to 2016. In 2009-2010 Haryana Roadways carried 11.1 lacs passenger per day and increased to 12.22 lacs in 2016-2017. There has been a significant improvement in other parameters like fleet size, fleet utilization and total staff. This has given an instinct to check the dynamic changes and performance of Haryana Roadways. On the basis of previous studies it cannot be concluded that at present Haryana Roadways are working in an efficient manner. Therefore, it is necessary to conduct an empirical study of Haryana Roadways at depot level till 2016-2017.