Measuring Efficiency of Hotels in Bomdila-Tawang Tourists Destinations

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[Abstract] Tourism and hospitality is one of the largest and fastest-growing industries and a key driver for the rapid growth of the service sector in India and the world. On the back of huge tourism potential in the country, the hospitality industry presently employs about 2.5 million people and also provides support to other allied industries. As per the Directorate of Tourism and the government of Arunachal Pradesh, Arunachal Pradesh, over the past few years, has observed a rapid rise of tourists' inflow, which has led to an increase in its share in the state's economy. The Bomdila-Tawang tourist circuit is one of the important tourist circuits that has contributed to boosting tourism in the state. The main objective of the paper is to determine the factors contributing to the efficiency of the hotels in the Bomdila-Tawang tourist circuit. The *Bomdila-Tawang tourist circuit, which offers a rich* flora and fauna, is the best way to enjoy scenic beauty along with recreational activities, and it has been found to be an effective tool to improve the livelihood of people and boost economic growth in the region.

The present study employed data envelopment analysis (DEA) and BCC and CCR models in order to measure the efficiency of hotels in the Bomdila-Tawang tourist circuit. DEA is a non-parametric technique of estimating the efficiency of decision-making units (DMUs). The efficiency of a firm is calculated by comparing output with input, i.e., efficiency equals output/input. The present paper employs four inputs and two outputs in order to measure efficiency using DEA-CCR and BCC models with a constant return to scale (CRS) and a variable return to scale (VRS) assumption. DEA in hotels is mostly applied in order to find out overall efficiency, managerial efficiency, and scale efficiency. It is found that hotels are doing better in outputs than inputs. Infrastructure is still a bottleneck for the development of the tourism and hospitality industry in the Bomdila-Tawang tourist circuit.

[Keywords] tourist circuit, efficiency, data envelopment analysis, decision-making units, hospitality industry

Introduction

Travel and tourism, which consists of a wide range of industries, is one of the largest economic sectors in the world. Travel and tourism create millions of jobs and drive exports, which accounted for 10.3% of global GDP and 330 million jobs, or 10.4% of total employment in 2019 (WTTC, 2020). A gradual rise in participation from middle-income groups and relaxation in visas, etc. are some of the main reasons for rapid growth in this sector. As per the UNWTO report, India ranked tenth with 194 billion US dollars with a growth rate of 4.9% in terms of travel and tourism contribution. Wars, insurgency, natural calamities, pandemic disease, etc., are some of the important aspects that obstruct travel and tourism as a booming industry. Rise of the Covid-19 pandemic worldwide affected the tourism sector mostly in 2020 and 2021. In India, due to the Covid-19 pandemic, approximately 2 to 5.5 people who are engaged directly and indirectly in the tourism sector have lost their jobs until August 2020 (Ministry of Tourism, GOI). Travel and tourism will remain an important driver for job creation in this dynamic and sophisticated era in spite of its huge loss due to Covid-19. Domestic tourists will be a key driver to bounce back in the nation's economy from the recession that occurred due to Covid-19 by providing employment opportunities in the travel and leisure business (WTTC, 2020).

WTTC 2020 reports that India witnessed the highest growth in the number of jobs created (6.36 million) in the travel and tourism business during the year 2014-2019, followed by China and the Philippines with 5.47 million and 2.53 million, respectively. India accounted for 2321.98 million domestic tourists with an annual growth rate of 25.3% and 10.93 million foreign tourists visiting and with an annual growth rate of 3.5% during the year 2019 (Ministry of Tourism, GOI, 2020). Tourism is the temporary, short-term movement of people to a destination outside the place where they normally live and work (Tourism Society, England 1976). As per UNWTO, "*tourism comprises the activities of persons travelling to and staying in*

places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes." Hotels under the hospitality industry are the central part of the tourism industry because hotels provide paid lodging to tourists. The tourism and hotel industry always go hand in hand, and it is truly justified that accommodation is the key part of tourism development. Thus, accommodation services and their efficiency in serving guests matters a lot for the growth and development of tourism in any region in the long run. The Bomdila-Tawang tourist circuit of Arunachal Pradesh, starting from Bhalukpong at 200 feet above sea level to Tawang at 15,000 feet above sea level, is one of the oldest tourist circuits and has highest number of visitors in Arunachal Pradesh. The Bomdila-Tawang tourist circuit, which offers rich a *flora and fauna like an or*chid sanctuary and an eagle nest wildlife sanctuary, adventure sports like mountaineering and trekking, horticulture orchards, unique topographic features, rich cultural and religious heritage sites, Asia's second oldest monasteries, etc., gives a fantastic variety for the tourists to spend their leisure time.

The success and survival of the hotel industry under the tourism sector are characterised by efficient resource planning and management. The present study looks at the employed data envelopment analysis (DEA) BCC and CCR model to measure the efficiency of the hotels in the Bomdila-Tawang tourist circuit. DEA is a non-parametric technique of estimating the efficiency of decision-making units (DMUs) and identifying the efficiency frontier line in a set of DMUs. DEA technique is widely used in tourism and hospitality in order to evaluate performance and efficiency, which helps in the decision-making process. For the regional hotel sector, technical efficiency evaluates the measure of comparative effectiveness with which it uses a set of inputs and outputs (Yinghua, Hani & Maxwell, 2011). To measure the overall organisational efficiency of hotels, the DEA model is useful, as it considers multiple inputs and outputs (Yen & Othman, 2011). The main objectives of the paper are the following:

1. To determine the factors contributing to the efficiency of hotels in the Bomdila-Tawang tourist circuit using the DEA model.
2. To provide a strategic framework to the hotel sector for the assessment of efficiency in order to gain a competitive advantage.

Literature Review

Tourism and Hospitality in the Bomdila-Tawang Tourist Circuit

Travelling in Tawang is the best way to enjoy the scenic beauty and recreational activities. Tourism and hospitality have been found to be effective tools to improve the livelihood of the people and boost economic growth in the region. In the tourism sector, accommodation plays a major role in tourists' satisfaction outcomes (Zacharias Tirkey & Kuru Yaja, 2017). Tourism in Bomdila-Tawang is lacking basic infrastructure, proper marketing, and reliable sources of information about the region in spite of its huge potential to become the best tourist destination in the country (Baruah & Goswami, 2017). Feedback from stakeholders in the tourism industry is important to draw a holistic conclusion. Ecotourism in Eaglenest, Bomdila, Arunachal Pradesh, has shown itself to be an outstanding tourists destination that offers bird watching, especially after the discovery of a new species of bird (Bugun Liochicla), which attracts tourists from all over the world (Peter Lobo, 2012). It is found that very little or negligible research has been done in the line of hospitality industry in the Bomdila-Tawang tourist circuit.

DEA as a Measure of Efficiency in Tourism and Hospitality

DEA has been widely used in the tourism and hotel industry to measure efficiency. DEA is a non-parametric technique of estimating the efficiency of decision-making units (DMUs). DEA helps in identifying the efficient and inefficient DMUs in a framework of study considering multiple inputs and outputs (Jorge, Elsa, & Lu 2013). The efficiency of a firm is calculated by comparing output with input. i.e. efficiency equals output/input. The DEA model was applied to evaluate organisational efficiency of the hotel and tourism industry. This study suggests that the DEA model can be applied by employing multiple inputs and outputs to measure efficiency in a hotel (Yen, & Othman, 2011). Data envelopment window analysis (DEWA) was applied to assess the efficiency of the hotel industry and explore contextual factors driving

technical efficiency (Huang, Mesak, Hsu, & Qu, 2012). The study defines relative efficiency (RE) as the ratio of output over input (RE = output/ input). Further, the technical efficiency (h_o) score lies between 0 to 1. Technical efficiency near to 1 indicates efficient DMUs, while TE<1 indicates technical inefficiency. Productivity in hotels using DEA can be used to identify specific local problems, and it helps to identify and decides appropriate strategies for productivity improvement (Sigala, Jones, Lockwood, & Airey, 2005). Data envelopment analysis (DEA) can be effectively applied to evaluate productivity and efficiency in the tourism and hospitality industry where the economic (Bosetti, V., Cassinelli, M., & Lanza, A. 2004) DEA output-oriented BCC model is applied to measure hotel efficiency on hotel internal accounting information (Poldrugovac, Tekavcic, & Jankovic, S., 2016). DEA with multiple inputs and outputs is advantageous for performance measurement and accounting information.

In the DEA, the constant returns to scale (CCR) model can be used in the tourism sector due to its better adaptability and ease of interpretation (Higuerey, Viñan-Merecí, Malo-Montoya, & Martínez-Fernández, 2020). This model helps to evaluate the average technical efficiency of hotels and helps in tourism planning and control. A DEA CCR and BCC model was applied to identify efficient frontiers line in the tourism sector in OECD countries (Kozhokulov, Chen, Yang, Issanova, Samarkhanov, & Aliyeva, 2019). This model helps to measure all kinds of efficiency, such as technical efficiency, structural efficiency, scale efficiency, allocation efficiency, and economic efficiency. The DEA model is very relevant for strategy development in tourist destinations, since it helps to evaluate the efficient use of destination resources vis-a-vis multiple destination outputs (Fuchs, 2004). Competitiveness of the service sector has been started and especially focuses on tourism destinations and the hotel industry (Tsai, Song, & Wong, 2009).

Table 1
Literature Survey on the Variable of DEA Model Used in Hotel and Tourism Industry

Authors	DEA method	Input variable	Output variable
González et al. (2015).	(DEA) Malmquist productivity index	Assets, Material costs, and Labor costs.	Total operating income
Huang et al. (2012).	DEWA-BCC model	Total number of full-time employees, Total number of rooms; Total fixed assets	Total revenue, Average occupancy rate
Poldrugovac et al. (2016)	DEA- output-oriented BCC model	Energy Expenses, Room expenses, F& B expenses, Labor expenses, Other expenses	Total Revenue, Occupancy rate
Yen, & Othman, (2011)	DEA- Malmquist TFP	Number of rooms available Number of employees (Book value of the property Total operating costs Other expenses F&B costs	Number of rooms occupied Number of guests Average occupancy rate Total operating revenues Other revenues F&B revenues
Fuchs, M. (2004)	variable returns to scale (VRS) DEA – CCR & BCC model	Labor, Infrastructure, Natural-environment	(Sales, occupancy, Market share, Profits
Bosetti, Cassinelli, & Lanza, (2004).	DEA – CCR & BCC model	Number of beds: Proxy for management costs (ISTAT) Solid Waste: Proxy for environmental costs (ARPA)	Rate of use: Proxy for profit from tourism (ANCITEL) Tourism presences/ number of beds
Bayrak, & Bahar, (2018).	DEA – CCR & BCC model	Number of arrivals, Tourism expenditure, Logistic performance index (LPI)	Tourism revenues
Higuerey, Et al. (2020).	DEA models, constant returns to scale (CCR)	Total personnel, The non-current assets Consumption	Revenue
Anderson et al. (2000)	DEA-CCR and DEA-BCC	Average employee annual wage, Average price of a room, Average price F&B, Average price of casino operations, Average price of Hotel operations, Average price of other expenses.	Total revenues consist of revenue from rooms, gaming, food and beverage, and other types.

Research Methodology

This research is based on empirical studies considering primary data collected from the hotels of the Bomdila-Tawang tourist circuit. In order to collect primary data from 20 hospitality units, a pre-set schedule/questionnaire has been framed, and, accordingly, data were collected through a field survey. Data was collected from three important tourist destinations: Bomdila, Dirang, and Tawang of the Bomdila-Tawang tourist circuit of Arunachal Pradesh, India. Later, to test the efficiency of hotels, data envelopment analysis (DEA) CCR and BCC model was employed using multiple inputs and outputs. DEA is a non-parametric technique of estimating the efficiency of decision-making units (DMUs). DEA in hotels is mostly applied in order to find overall efficiency, pure technical efficiency (PTE)/managerial efficiency, and scale efficiency. Technical efficiency (TE) relates to the productivity of inputs (Sathye, 2001). A measure of technical efficiency under the assumption of constant return to scale (CRS) is called overall technical efficiency (OTE). Pure technical efficiency (PTE) is used as an index for managerial performance. Variables under the assumption of a variable return to scale (VRS) help in obtaining pure technical efficiency (PTE). Scale efficiency (SE), or size of operation measure is obtained by the ratio between technical efficiency and pure technical efficiency, i.e. TE/PTE.

Input-Output Variables Considered to Measure Efficiency

Four inputs and two outputs are considered in order to measure efficiency using DEA- CCR and BCC models with a constant return to scale (CRS) and variable return to scale (VRS) assumption. Input and output variables are considered as per literature review and as per reliability of the model. The variables that are considered under the study are given in table the below:

Table 2
Input-Output Considered Measuring Efficiency

Inputs	Outputs
Number of people engaged	Number of guests served
Number of rooms available for sale	Total revenue
Total operating costs	
Total fixed capital employed	

Analysis and Discussion

To analyze the administrative and operational efficiency (efficiency = output ÷ input) of hotels in the Bomdila-Tawang tourist circuit, the following parameters are considered: 1) technical efficiency or overall efficiency, 2) pure technical efficiency or managerial efficiency, 3) scale efficiency or size of operation.

Technical Efficiency or Overall Efficiency

The technical efficiency score lies between 0 to 1. A technical efficiency score that lies at 1 or near to 1 indicates efficient DMUs, while TE far <1 indicates technical inefficiency. Technical efficiency refers to the ability of a hotel to get maximum output at a given level of input with reference to production function (Paço, & Pérez, 2013). A DEA CCR model under constant return to scale (CRS) assumption was evaluated as shown in the table given below:

DEA model = DEA-Solver LV8.0/ CCR(CCR-I)

Table 3
Technical Efficiency/ Overall Efficiency of Hotels in Bomdila-Tawang Tourist Circuit

Sl. No.	Name of DMUs	Efficiency score
1	Highlander Inn	0.4794
2	Seguel Hotel	1.0000
3	Lungta Residency	1.0000
4	Hotel La	1.0000
5	Siphyang – Phong	0.6191
6	Tsepal Yangjom	1.0000
7	Zambala Hotel	1.0000
8	Nuranang Resort	0.9552
9	Hotel Buddha	0.9053
10	Hotel NEFA	1.0000
11	Yangsel	1.0000
12	Yul Pemachen	1.0000
13	Hotel Ajanta	0.7614
14	Gyaki Khang Zhang	0.9451
15	Tawang Monastery Kalawangpo	1.0000
16	Jax- Star	1.0000
17	Dekhang Hotel	1.0000
18	Sangrila Hotel	1.0000
19	Ashoka	1.0000
20	Tawang Hotel	1.0000

From the above table of technical efficiency scores, 14 hotels are observed as efficient DMUs under constant to return scale assumption, while 6 hotels are inefficient DMUs. Efficient DMUs are those whose efficiency score is near 1, whereas, inefficient DMUs are those whose scores are less than 1. Further, it is observed that hotels whose efficiency score is higher have achieved efficiency because these hotels have efficiently utilised input I, input-II, and input-III, i.e., the number of people engaged, number of rooms available for sale, and total operating costs. It is also observed that both the output of hotels in the Bomdila-Tawang tourist circuit are found to be efficient. Thus, tourism and hospitality in Tawang have been found to be effective tools to improve the livelihood of the people and boost economic growth in the region (Tirkey & Yaja, 2017). It is to be noted that inefficient DMUs should concentrate on input variables in order to reach par with efficient DMUs. Further, it is observed that the Bomdila-Tawang tourist circuit has infrastructural constraints, marketing constraints, and a lack of reliable sources of information on tourist destinations (Baruah & Goswami, 2017).

Pure Technical Efficiency (PTE) or Managerial Efficiency and Scale Efficiency (SE) or Size of Operations

Pure technical efficiency (PTE) is used as an index for managerial performance. Variables under the assumption of a variable return to scale (VRS) help in obtaining pure technical efficiency (PTE). Pure technical efficiency helps to obtain the efficiency frontier under the assumption of a variable return to scale (Kumar, & Gulati, 2008). Pure technical efficiency measurement helps the hotel industry to achieve continuous improvement of its services and achieve customer satisfaction and sustainability. The scale efficiency (SE) measure is obtained by the ratio between the technical efficiency and the pure technical efficiency, which helps the management to choose the optimum size of resources. The reason for including this ratio to measure scale efficiencies stems from the fact that VRS is due to scale effects, while CRS is due to the absence of the latter (Barros, 2005).

DEA model = DEA-Solver LV8.0/ BCC (BCC-I)

Table 4
Pure Technical Efficiency (PTE) And Scale Efficiency of Bomdila-Tawang Tourist Circuit

Sl. No.	Name of DMUs	PTE score under BCC input-oriented model	Scale efficiency (SE) score
1	Highlander Inn	0.8331	0.5754
2	Seguel Hotel	1.0000	1.0000
3	Lungta Residency	1.0000	1.0000
4	Hotel La	1.0000	1.0000
5	Siphyang - Phong	0.6445	0.9606
6	Tsepal Yangjom	1.0000	1.0000
7	Zambala Hotel	1.0000	1.0000
8	Nuranang Resort	1.0000	0.9552
9	Hotel Buddha	0.9172	0.9870
10	Hotel NEFA	1.0000	1.0000
11	Yangsel	1.0000	1.0000
12	Yul Pemachen	1.0000	1.0000
13	Hotel Ajanta	0.7634	0.9974
14	Gyaki Khang Zhang	1.0000	0.9451
15	Tawang Monastery Kalawangpo	1.0000	1.0000
16	Jax- Star	1.0000	1.0000
17	Dekhang Hotel	1.0000	1.0000
18	Sangrila Hotel	1.0000	1.0000
19	Ashoka	1.0000	1.0000
20	Tawang Hotel	1.0000	1.0000

It has been observed from the above table that 16 hotels are efficient DMUs, while 4 hotels are inefficient DMUs under DEA-BCC variable return to scale assumptions. Thus, it can be concluded that most of the hotels in the Bomdila-Tawang tourist circuit are managerially efficient; i.e., they have achieved the optimum in managing their inputs in order to produce a desired level of outputs. Further, it was observed that the average efficiency of DMUs under the BCC model is higher than the average efficiency of DMUs under CCR assumptions. Pure technical efficiency helps in evaluating average efficiency and can be useful as a tool for planning and control in the hotel industry and to identify the efficiency frontier line (Kozhokulov, Chen, Yang, Issanova, Samarkhanov, & Aliyeva, 2019).

According to scale efficiency (SE) or size of operations measure, it is observed that 14 hotels are efficient DMUs, while 6 hotels are inefficient DMUs (as shown in the above table). Thus, it can be said that on the basis of the size of operations, too, average hotels in the Bomdila-Tawang tourist circuit are in the line of the efficiency frontier. The size of hotels in the Bomdila-Tawang tourist circuit is still small in all respects. Applying DEA models in hotels of the Bomdila-Tawang tourist circuit will help stakeholders to increase their size of operation under scale efficiency parameters. In summary, it can be seen that the hotels of Tawang are more efficient, on average, due to larger numbers of tourist influx and better input management than the hotels of Bomdila and Dirang.

Findings, Conclusion, and Recommendations

Hotels have two options to increase their efficiency. First, they have the option to reduce inputs like the number of people engaged, the number of rooms available for sale, total operating costs and fixed costs, etc. Second, they have the option to increase their outputs, like the number of guests served and the total revenue, etc. It is found that the hotels of Tawang are efficient in both the output, i.e., the number of guests served and total revenues, because the percentage of guest stay nights is higher as compared to other tourist destinations. Further, the hotels of Tawang, as compared to others in the region, have minimum slack on all the inputs. It has been observed that the hotels of Bomdila and Tawang are more efficient with regards to output than input and can be effective tools to improve the economic livelihood and as an alternative to unemployment problems in Arunachal Pradesh. Infrastructural constraints are still the bottleneck for hoteliers to improve their efficiency score at the input level. Arunachal Pradesh falls under a restricted area; official permission is necessary to enter the state, even for a person who is a resident of India. Travel restrictions like protected area permits (PAP) and restricted area permits (RAP) have been a major challenge for tourist visiting Arunachal Pradesh (Thakuria, 2018). Further, it also hampers the productivity of the hotel industry. The tourist situation in the Bomdila-Tawang tourist circuit shows a marked seasonality, as it was not in European countries, but its attractions and hotel service are maintained all months of the year.

It is worth mentioning that the hotels of Tawang have been the worst affected due to the spread of Covid-19. It is no doubt that the Covid-19 pandemic has hit tourism and hospitality industry badly in the Bomdila-Tawang tourist circuit, too, but the percentage of bankruptcies among the hotels in Tawang is more than other tourist destinations in the region. Further, it is observed that the tourism and hospitality industry in the region tries to revive its track during December 2020 – March 2021, but, again, due to the coming of the second wave Covid-19, this industry has been put on halt. Furthermore, it is suggested that the inflow of domestic tourists will be crucial for reviving this industry. Infrastructure is still a bottleneck for the development of the tourism and hospitality industry in the region. Better staff, skilled training, and the need to up-grade is felt in this region. Further, it is observed that the tourism and hospitality business in the Bomdila-Tawang tourist circuit is seasonal, which means it runs only for six months in October-December and March-May. But, gradually, the rise in length of season is observed from tourist arrival report of the last 10 years.

Using DEA methodology, this paper analyzed the administrative and operational efficiency of hotels before the impact of the Covid-19 pandemic in Bomdila-Tawang tourist destinations. During the Covid-19 period, the hotel industry in this region was completely shut down by the state government. Further, the tourist flow in the region was put under restriction by the state government. The analysis on the basis of DEA allows firms to employ multiple inputs and outputs in determining relative efficiency. Further, benchmarking helps inefficient DMUs to improve their operational performances. Benchmarks are provided for improving the operations of poorly-performing hotels (Barros, 2005).

Implications and Future Research

From the available literature, it is found that no research has been done on the efficiency of the hospitality industry in Arunachal Pradesh. Some research work on tourism has been done, and that, too, is in the line of tourist satisfaction and destination. This research will help the stakeholders to know the insights on how the hospitality industry is performing and help in identifying their managerial performance. This research, too, is not exempt from limitations that have to be contemplated in the future that has to be incorporated. There are some variables that were not considered, like average tourist expenditure and average food and beverage costs, etc., in the present study due to lack of information. Further, it will be more effective if we link tourist satisfaction to the hotel industry and efficiency of the hotel industry because an efficient hotel must show higher tourist satisfaction.

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